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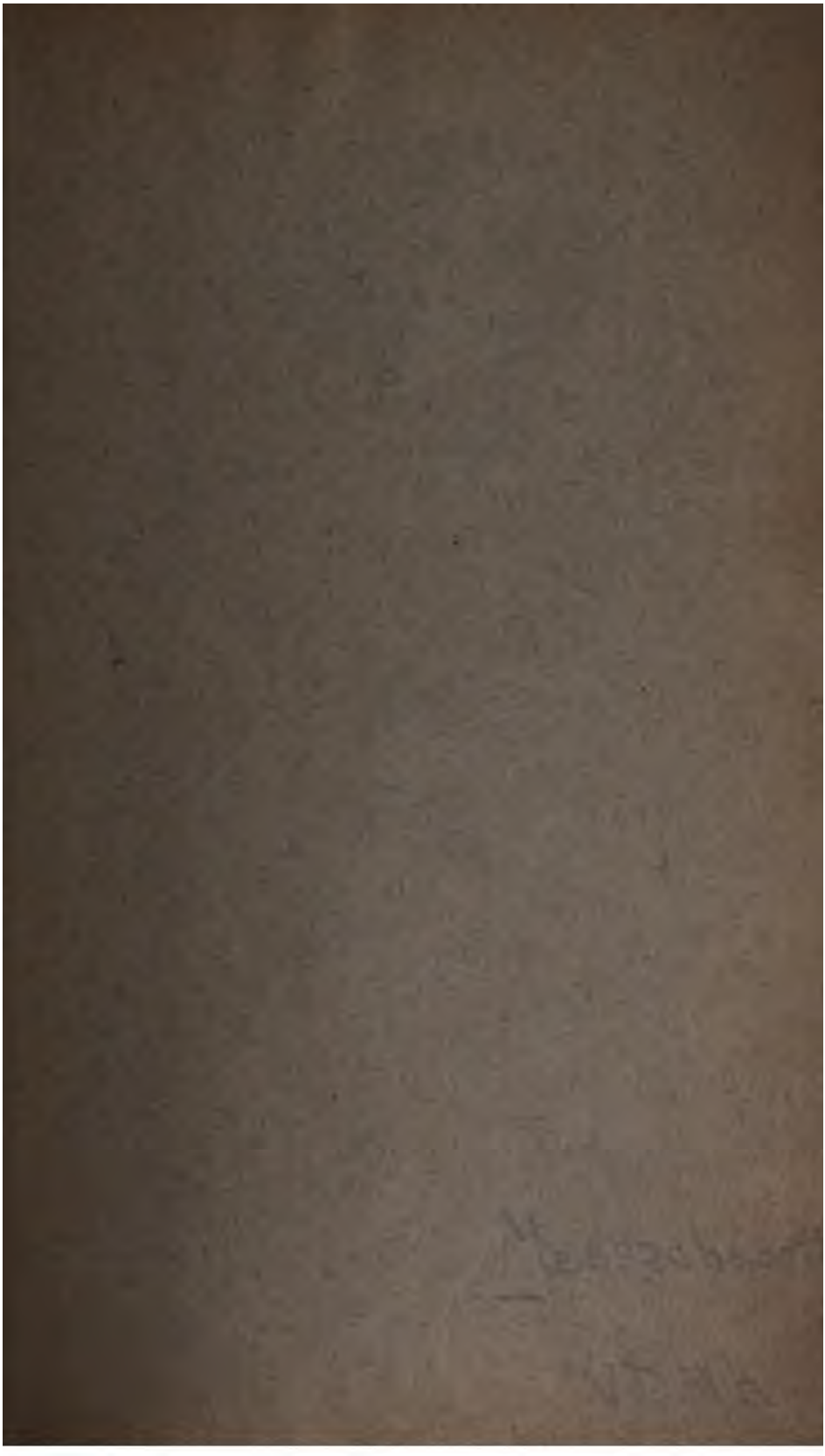

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ANNUAL REPORT

OF THE

BOARD OF HARBOR AND LAND COMMISSIONERS

FOR THE YEAR 1897.

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Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1897, covering a period of twelve months, from Nov. 30, 1896.

Every year brings an access of business of a character which needs the personal attention of the commissioners. Every new subject matter over which the Board is given jurisdiction, or with reference to which an examination and report is required, brings with it a multitude of lesser requirements, such as the visitation of localities, conferences with individuals, examination of documents and answers to inquiries from others, which take up time.

In systematizing the business of the office, the Board has found it convenient to have a return day, on which parties petitioning may come in and be heard, either in person, or, as often happens, by counsel, whereby the hearings are now and again extended by continuances, in which questions of law and fact are presented and argued, and have to be finally determined by the Board.

In addition to its other duties, the Board conducts a bureau of information, relative to matters over which it has charge, and the inquiries relating thereto are repeated and constant. In order not to disappoint the public and to insure a regular and systematic performance of all its duties, the Board has substantially daily sessions for five days out of the week, and during all the business hours of each day it endeavors to have at least one of its members present.

In the past year one hundred and sixty-five formal hearings have been given, at which one hundred and eight petitions for licenses to build and maintain structures, and for privileges in tide waters and great ponds, were heard and determined; and of these, one hundred and four were granted, one withdrawn and three denied.

Of the hearings not given at the commissioners' rooms in the State House, two were given at Cotuit and Osterville on Sept. 9 and 10, 1897, under chapter 483 of the Acts of 1897, for the purpose of personal acquaintance with the locality and people, and of listening to the testimony of all parties interested in the construction of a channel from Osterville Bay to Vineyard Sound.

On Oct. 22, 1897, a hearing was given by the Joint Board of Harbor and Land Commissioners and State Board of Health, at Green Harbor, under the provisions of chapter 495 of the Acts of 1896 and chapter 98 of the Resolves of 1897, relative to the restoration of Green Harbor in Marshfield.

On Oct. 29, 1897, a hearing was given in Springfield, under the provisions of chapter 82 of the Resolves of 1897, relative to the improvement of the navigation of the Connecticut River.

All other hearings were given by the Board in Boston.

In addition to the licenses granted on petitions which have to be accompanied by plans and recorded in the various registries of deeds, the Board has granted sixty-six permits (for convenience so called) not requiring registration, some of which were accompanied by plans and required a formal hearing, whereas others were of a nature such as could be treated informally, without prejudice to the rights of third persons.

During the year the Board has made seventy-six inspections of premises necessary to be visited before granting petitions and privileges, and also for the sake of determining if the Board's directions had been faithfully carried out and authorized appropriations had been rightly and economically expended.

Among other places visited have been Provincetown, Gay Head, Chatham, Cotuit, Springfield, Beverly Farms, Agawam

and Holyoke. For the purpose of a personal inspection of the Connecticut River, the Board proceeded by water from Springfield to Holyoke on one occasion, and on another from Springfield to Hartford, Conn., through the Windsor Locks canal, in order that the problem submitted under chapter 82 of the Resolves of 1897 might be better understood.

In the pursuit of information relative to the latest improvement in the manner of building and equipping modern piers, with direct reference to the construction of the Commonwealth's pier at South Boston, the Board, with its engineer, has recently visited Philadelphia and New York, and consulted with the engineers connected with the improvement of the water fronts in those places.

South Boston Flats.

On that portion of the Commonwealth's flats at South Boston south of Congress Street but little work has been required. The streets and sewers are generally in good condition. The carts of the street department of the city have continued during the year to deposit ashes and street sweepings on the blocks between C and E streets. On the area north of Congress Street material taken from cellar excavations and other similar sources and brought to the flats for a dump has been largely used for additional filling in the low spots caused by the settling of the material which was taken from the harbor and deposited on the lot leased to L. G. Burnham & Co. As the material of this class was insufficient to do all that was required at this place, a contract * was made, March 11, 1897, with the Bay State Dredging Company, the lowest bidder, to dredge about 4,000 cubic yards of material from the adjacent flats, and place the same on the filled land just inside the easterly bulkhead. Under this contract 4,356 yards were dredged and deposited, at a cost of $808.97. The work was completed May 5, 1897. This material was carted onto the premises and spread there without cost to the Commonwealth.

In accordance with the provisions of chapter 392 of the

* See Appendix C.

Acts of 1897, a lease to L. G. Burnham & Co. of about 6½ acres of the filled land, together with a small wharf, was executed under date of April 1, 1897, for a term of fifteen years.

A contract with Albert A. Hersey for building the wharf aforesaid, which was in force at the date of the last report, was completed May 14, 1897, at a total cost of $7,742.10. Upon completion of the wharf, the exposed condition in which vessels lying at it would be placed was observed, and it was decided that a breakwater to protect vessels from the northerly and westerly winds and waves would be necessary. For this purpose a breakwater 10 feet wide and 400 feet long, parallel with and 100 feet north-westerly from the wharf, was constructed, without expense to the Commonwealth, thus forming a protected berth for vessels lying at the wharf.

The dredging of a channel 75 feet wide, 18 feet deep and 1,550 feet long from the main ship channel to this wharf, under a contract with the New England Dredging Company, which was in force at the date of the last report, was completed April 15, 1897, at a cost of $13,945. During this dredging a ledge was uncovered on the easterly side of the channel and about 120 feet northerly of the exterior line of occupation of the flats. This ledge projected about 20 feet into the channel and about 4 feet above the required depth. It contained about 40 cubic yards, lying above the grade of 18½ feet below mean low water.

After advertising for proposals, a contract * for its removal was made May 20, 1897, with Hiram W. Phillips of Quincy, the lowest bidder, at a cost of $777. This work was completed June 22, 1897.

A buoy was placed near the entrance to the channel on the location of this ledge, and this entrance being at about the centre of the area assigned for the general anchorage of vessels in the harbor, was usually found occupied by some vessel at anchor when wanted for use as a channel. In order to bring the attention of masters of vessels to the entrance, that they might avoid anchoring in such a manner as to

* See Appendix D.

obstruct it, the Board requested the inspector of the light-house establishment for this district to place two buoys in the entrance to the channel. He at once complied with this request, and it is anticipated that no further difficulty will be experienced.

Capacious and expensive structures, equipped with every modern appliance for speedy and economical handling of coal on a large scale, have been erected on the premises leased, and relieve the location from its former appearance of remoteness and isolation.

Under the authority given by chapter 513 of the Acts of 1897, plans and specifications were prepared, and after due advertisement, a contract * was made with Messrs. Perkins, White & Co., under date of Nov. 15, 1897, to build the solid portion of a new pier on the northerly side of the Commonwealth's property, for the sum of $198,416, the work to be completed Feb. 1, 1899. Before preparing these plans, careful studies were made as to the best location, proportions and method of construction for the proposed pier. The location finally determined on is east of and substantially parallel with Pier No. 4 of the New England Railroad Company, leaving a dock 175 feet wide between the face of the proposed pier and the boundary line between the Commonwealth's property and that of the railroad company. The plans of the railroad company provide for a dock 100 feet wide on its side of the boundary line, which, together with the width left by the Commonwealth, will make a dock 275 feet wide between the piers.

The pier when completed will be 400 feet wide and 1,200 feet long. The method of construction will be by building a central portion or core of solid filling, to be dredged from the adjacent docks. This will be enclosed by a sea wall of granite blocks resting on a foundation of piles driven to extreme low-water mark, the entire structure having a length of 1,150 feet and a width of 300 feet. Surrounding the piles a riprap of stone and gravel will slope down to the dock to a depth of 30 feet at mean low water. This slope will ultimately be covered by a platform 50 feet wide, to be con-

* See Appendix B.

structed outside and around the two sides and the end of the masonry, thus completing the projected width of 400 feet and length of 1,200 feet, and creating a surface of wharf area of about 11 acres, around which docks may be dredged and maintained to the depth of 35 and even 40 feet at low water if desired without danger of undermining the structure.

Work under this contract for the solid core and masonry was commenced the first of December.

Inquiry was early made with reference to occupation of the pier when completed, and now negotiations are in progress looking toward a long-term lease of the entire pier and docks.

It is essential to the proper development and occupancy of the proposed pier and entire water front of this Commonwealth flats property that it should have suitable and convenient railroad connections, and these could be readily arranged and maintained in connection with the tracks of the New England Railroad Company.

It is also planned in connection with the pier, to construct a proper approach for a car-float ferry, in order that carloads of merchandise may be transported from terminals on the north and east sides of the harbor to this pier without breaking bulk.

It is becoming recognized that the use of water-ways for distribution of freight at the end of a railroad terminal is the most economical means of conveyance.

As has been said recently in one of the leading engineering papers published in this country, in reference to distributing freight entering New York on the west side over the trunk line terminals and their proposed connections with New York by means of bridges and tunnels for the purpose of export: "The fact is, that, instead of the North River being a barrier to traffic under present conditions, it is really a vast distributing yard, with its tracks always maintained free of cost, and in which a train can move from one point to any other without obstruction or delay." . . . "The car-float goes from the Jersey City pier to any point on the East River, the Harlem River or the harbor; and, by reason of this enormous mileage of water front, a loaded freight car

can be delivered at a warehouse close to its final destination at less total actual cost than the switching charges for similar transfer in any other great city of the country."

In the ways thus indicated the Commonwealth pier will be in close contact with all the railroads entering Boston.

Northern Avenue.

Nothing has been done during the year towards the laying out or construction of Northern Avenue, but in order to fully utilize the new pier and dock now being constructed on the Commonwealth's flats, some action must be taken in this matter during the coming year.

The necessity for another bridge across Fort Point Channel is very pressing. Congress Street bridge is over-taxed, and is now in an almost dangerous condition. It was built in 1874, and is twenty-three years old. But few repairs have been made on the main portion of the bridge, with the exception of what have been absolutely necessary to keep the pavement from dropping through the floor. At the present time a portion of the sidewalk is fenced off as dangerous to travel. Many of the piles of the bridge require renewal, but the traffic is so great that serious inconvenience and expensive delays would be involved in shutting off traffic in order to make repairs. The construction of the new bridge at Summer Street, owing to its grade and the additional distance necessary to be traveled to reach the railroad freight yards, will not furnish adequate relief for this bridge.

The removal of freight yards to the New England locations will vastly increase the trucking across Fort Point Channel. In addition, the business traffic incident to the occupation of the new eleven-acre pier must be provided for. This requires that direct and not circuitous nor deviating routes should be established, leading straight to the centres of business. The time has therefore arrived when public necessity and convenience require the laying out and building of Northern Avenue and of Northern Avenue bridge across Fort Point Channel at the foot of Oliver Street. The landing on the west side was taken for that purpose by the city

in 1873, and, while awaiting the building of the new bridge, is temporarily used as a place for loading the offal scows which are towed to sea for the disposal of their cargoes.

The recommendations in this behalf made in the last report of this Board on page 7 are again most respectfully urged upon the attention of the Legislature. The large and valuable property of the Commonwealth at South Boston is ripe for utilization and development, and private interests should not be permitted to stand in the way of its expansion into an available asset.

Congress Street.

The commission appointed by the superior court under the grade crossing act for the abolition of the grade crossing of Congress Street, made by the tracks in the freight yard of the New England Railroad Company, the authority whereof was extended by chapter 535 of the Acts of 1896, completed its work and filed its report on March 10, 1897. The report was accepted by the court, and a decree* was entered on March 13, following. This decree provides for the discontinuance of that portion of Congress Street which lies between the easterly and westerly side lines of the New England Railroad Company's property, and in lieu thereof further provides for the construction of a new street 100 feet wide in extension of Summer Street, starting from the harbor line on the Boston side of Fort Point Channel, crossing Fort Port Channel by a steel bridge resting on stone piers and abutments, with a double sliding draw, having a passageway for vessels 50 feet wide, and thence crossing property of the Boston Wharf Company, of the railroad company and of the Commonwealth to a junction with existing Congress Street at its intersection with D Street. From this point Congress Street is widened to 100 feet as far as the sea wall on the northerly side of the reserved channel. This new Summer Street is to be an elevated structure, starting at grade on the west side of Fort Point Channel, and rising with a maximum grade of $1\frac{3}{4}$ per cent. to the railroad property, where it is $24\frac{1}{2}$ feet above the present grade of Congress Street. Crossing the railroad property at a level, it descends with a

* See Appendix I.

maximum grade of 1½ per cent. to the present grade of Congress Street, at a point about 260 feet east of E Street. The existing streets which it crosses, together with the tracks in the railroad yard, are to be spanned by steel bridges, supported on stone and steel piers and abutments.

A new cross street 80 feet wide, in extension of Dorchester Avenue, is to be built along the harbor line on the west side of Fort Point Channel from the end of the new street to Congress Street, and Congress Street from Atlantic Avenue to the harbor line is to be widened from 60 feet, its present width, to 80 feet.

Two approaches are to be built to the elevated portions of the new Summer Street on the easterly side of Fort Point Channel. One will be 60 feet wide, with a grade of 1.7 per cent., from a point on the new street near the harbor line, along substantially the location of the old main line tracks of the New England Railroad, to A Street. The other approach is wholly on land of the Commonwealth. It starts at the intersection of the new street with D Street, and follows D Street 80 feet wide to Fargo Street, and thence along Fargo Street 50 feet wide to C Street, where it reaches the existing grade of the streets on the Commonwealth's property. The grade of this portion of the approach is about 1½ per cent. From Fargo Street it follows C Street to Congress Street, passing under the new street.

The roadway throughout the entire length of the new street and its approaches is to be paved with granite blocks, with the exception of the movable draw of the bridge over Fort Point Channel. The sidewalks on the bridges are to be paved with asphalt. On the other portions the sidewalks will be of brick, plank or crushed stone.

Under the decree, the work of building the bridge over the railroad tracks is to be done by the railroad company. All the other work is to be done by the city of Boston.

The decree also provides that the expense of the whole work shall be borne jointly by the Commonwealth, the railroad company and the city of Boston, in the following proportions: the Commonwealth, 31 per cent.; the city, 30 per cent.; the railroad company, 39 per cent. High commendation is due to the office of the Attorney-General for the skill

and ability with which the case of the Commonwealth was prepared and conducted.

Since the filing of the decree, work on the preparation of plans for the necessary structures has progressed, and a contract has been executed for the construction of the abutment at the Boston end of the bridge over Fort Point Channel. Work will be advanced on the balance of the structures during the coming season.

Uncertainty as to what the determination of the commissioners would be, and, since their report was filed, as to how soon the work could be carried out, or how damages were to be adjusted, has made it impracticable for this Board thus far to shape any definite plans for future action, or even to give absolute assurances to parties seeking information relative to the purchase or improvement of the Commonwealth's property, although many inquiries have been made respecting portions of the Commonwealth's flats lying south of Congress Street.

The situation relative to selling the land adjacent to the new street is still further complicated by the action of the Boston Real Estate Trust in instituting proceedings to disturb the decree of the commissioners.

The fulfilment of this project involves taking from the Commonwealth for street purposes, in addition to what has already been taken by the city, 286,768 square feet of land. Of this, 217,756 square feet are within areas which the Commonwealth has already set apart for use as streets on the South Boston flats. Of the remainder, 66,404 square feet are taken from areas on the South Boston flats previously designed to be used for business purposes; and the balance, 2,608 square feet, are in the tide waters of Fort Point Channel within the harbor line on the Boston side, and are taken for widening Congress Street between Atlantic Avenue and the harbor line.

Commonwealth's Flats Improvement Fund.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1896, was $75,475.21. To this has been added during the year $5,103.41 from the

income of the fund and $54,815.37 from sales and rents of land and from other sources, making a total of $135,393.99. Of this sum there has been expended during the year $29,228.68, leaving an available balance on Nov. 30, 1897, of $106,165.31.

Surveys, etc.

Surveys in every direction are constantly increasing, and call continuously for time and labor. The force in the office has been increased to meet the growing demand and enable the work to be done without deterioration in quality and with regard to the maintenance of the usual high degree of efficiency.

In December, 1896, and January and March, 1897, lines and grades were given at various times for the construction of the wharf at the South Boston flats, built under contract with Albert A. Hersey, and in March and April surveys were made of the channel which was dredged by the New England Dredging Company as an approach to this wharf, which has been leased to L. G. Burnham & Co.

Lines and grades for the construction of drains and the laying of water pipes by the city through the streets on the South Boston flats have been given from time to time throughout the year; and in September and October surveys and soundings were made on the location of the new pier now under construction. In November the necessary surveys were made for staking out and defining the lines for the work of construction of the pier. In December, 1896, and January and February, 1897, soundings were taken over the areas dredged under the contract with the New England Dredging Company, opposite the Grand Junction wharves at East Boston. During the same months surveys were made over the areas dredged under contract with the Eastern Dredging Company, opposite the Mystic wharves of the Boston & Maine Railroad Corporation in Mystic River, Charlestown.

On March 2, at the request of the superintendent of the coast survey, a few lines were run and soundings made opposite the Navy Yard, to see if any changes had been made there since the last survey in 1892.

On March 5, soundings were taken opposite the wharf of

the Boston Electric Light Company on Fort Point Channel, to determine if any shoaling had been caused there by the dumping of material at the foot of Summer Street extension.

March 8 to 10, soundings were taken in the canal leading to the wharves on the Cambridge side of Charles River, near Craigie Bridge, to determine the amount of shoaling which had taken place there from various causes.

In May and June the topographical survey of the Connecticut River between the towns of Hatfield and Hadley was continued, and the first sheet of the survey, which was reported as partially completed last year, was substantially finished.

May 13 to 17, surveys were made at Beverly, to determine the location of the mean high-water line on the premises of Messrs. Swan & Woodberry.

In June, July and November, the topographical survey of the Mystic River was continued, two sheets being completed and a third one nearly so. This work is a continuation of the general resurvey of Boston harbor, which the Board is completing gradually, keeping it ahead as much as possible of general improvements, in order to study the best methods of making them and to furnish data for advising with and assisting engineers and others who are planning improvements along the water front. These surveys form the basis from which the Board calculates the areas of public land which are to be occupied by licensed structures, as well as the amount of tide water which is displaced by their building. The surveys are prosecuted from time to time each year whenever the field party can be spared from more pressing duties.

On June 7, surveys were made to determine the location of the bounds which are to be placed by the towns to mark the boundary line established by chapter 302 of the Acts of 1897 between Marion and Wareham.

In June and November surveys were made and bounds were set to mark the boundary line between the towns of Gay Head and Chilmark, established by chapter 323 of the Acts of 1897.

In July, August and September surveys were made of the

bays and inlets forming the harbors of Cotuit and Osterville, in connection with the investigation which was being carried on by the Board under the provisions of chapter 483 of the Acts of 1897.

October 18, surveys were made to determine the location of various borings which had been made by private parties in Charles River above West Boston Bridge.

November 17, a survey was made to determine the location of the harbor line on the easterly side of Fort Point Channel, south of Mt. Washington Avenue Bridge.

In the latter part of November and the first part of December surveys and soundings were made between Wood Island and Jeffries Point at East Boston, to determine the extent and location of the various channels through the flats.

The results of these surveys have been plotted and permanent records of the information have been made and filed in the office and many plans have been drawn based on these surveys, for the use and information of the Board and others.

In addition to the foregoing, many small surveys and examinations have been made for the purpose of determining the amount of tide water displaced by various structures which have been built in tide water under licenses from the Board.

Since moving into new quarters, the plans and records have been arranged and made more readily accessible. The work of mounting and repairing old plans and arranging and indexing them has gone on with rapidity. Now they are practically safe from danger by fire. Calls for information from engineers and others are constantly increasing. These inquiries cover a large range of subjects. The larger part can be answered by reference to the manuscript plans and notes of surveys. A large number, however, relate to matters concerning which the Board and its engineers have collected many plans, reports and other information from various sources since its organization, and have preserved and arranged collectively in the office, so as to be easily accessible at all times. Much work of this kind remains to be done, and will be prosecuted as time can be spared from more pressing duties.

Boston Harbor.

The growth and concentration of business at the port of Boston creates a constant demand for increased accommodation. Wider and deeper channels are needed, and the Federal government is supplying them with reasonable speed.

Already the main ship channel has been dredged to a depth of 27 feet at mean low water, with the width of 1,000 feet from the entrance at Boston Light to the Narrows, and a contract has been entered into for continuing that same depth and width up to the city wharves.

In addition, a new ship channel out from President Roads straight away through Broad Sound has been surveyed during the past summer, and is found feasible. It is projected to have a depth of 30 feet at mean low water and a width of 1,200 feet, thus meeting the requirements of the largest of modern steamships, and is estimated to cost something under a half million dollars. This same width and depth ultimately without doubt will become the dimensions of the main channel, as far up as the Navy Yard.

The Commonwealth meanwhile has been doing all in its power to prepare suitable accommodation in the upper harbor by dredging in places not contemplated by the Federal government, and yet outside private ownership and occupation, for the steamships of increased size already plying between this port and Europe.

By chapter 330 of the Acts of 1896 an appropriation of $150,000 was made by the Legislature, to be expended in dredging the areas lying between the ship channel in Boston harbor and the wharves over areas which were not provided for in the last appropriations made by the Federal government. At the date of the last report two contracts were in force under this appropriation. One was with the New England Dredging Company, to dredge about 127,000 cubic yards from areas in Boston harbor opposite the Grand Junction wharves in East Boston. This work was completed in a satisfactory manner March 1 of the present year, and there is now, in consequence thereof, ample area and depth of water for transatlantic steamships of the largest class, coming to these wharves, to navigate with safety.

The other, for dredging about 218,000 cubic yards near the Mystic Wharf of the Boston & Maine Railroad corporation at Charlestown, was satisfactorily completed early in February. This work, upon the completion of the project which the Federal government now has under contract, will give a channel having a depth of 27 feet at mean low water from these wharves to the sea, thus providing a capacious and convenient water-way for vessels of the deepest draught to the largest grain elevator on the Atlantic coast.

Acting upon the recommendations of the State Board on Docks and Terminal Facilities, the Legislature last winter appropriated $100,000, and authorized the Board to take by purchase or otherwise certain parcels of flats at East Boston, to secure the same for future use and enjoyment in the interest of maritime commerce. The flats covered by authority of chapter 486 of the Acts of 1897 are in many different parcels, in the hands of widely scattered owners; and the delays incident to carrying on negotiations under these circumstances, as well as to making surveys of the premises, have prolonged the time within which the Board had hoped to accomplish its object. Some doubt if the amount of the appropriation were going to be large enough to cover the desired acquisition of territory has required extraordinary caution in conducting negotiations. The Board, however, is not without hope of making the acquisition.

A further liberal appropriation of $400,000 was made by chapter 513 of the Acts of 1897, for the purpose of constructing a modern pier at South Boston, as hereinbefore recited.

The preparation of the port for its due share of the growing commerce of this country is thus receiving attention from both the Federal and the State government; and when all projects are completed, it will be second to none in safety for entering and navigating at all stages of the tide by the largest vessels that are building.

Fort Point Channel.

This channel has been improved by the Federal government, by excavation to a width of 175 feet, with 23 feet of depth at mean low water, from its entrance to Congress Street bridge, a distance of 1,900 feet.

The full project for this improvement is the excavation of a continuous channel of these dimensions, from the entrance to near Federal Street bridge, a distance of 4,100 feet, which is estimated to cost $100,000.

Further progress in this improvement has been awaiting the reconstruction of the New England Railroad bridge, which, out of the rearrangement resulting from the location and construction of the Southern Union Railroad Station, will be now wholly removed.

On Sept. 7, 1897, the Board granted a license to the city of Boston, under the provisions of chapter 19, Public Statutes, and chapter 535 of the Acts of 1896, to build a steel girder bridge on stone piers, with retractile draws on a pile foundation, and pile draw piers, across Fort Point Channel, the clear passageway for vessels through said bridge to be not less than 50 feet wide. The above license of the Board was granted subject to the laws of the United States, and was on condition that all of the present pile bridge and draw pier of the New England Railroad Company across said channel between the harbor lines shall be removed to the satisfaction of the Board; that a channel shall be dredged from deep water on the easterly side of the draw-pier of Congress Street bridge in and through said bridge to and through the draw-way of the bridge so licensed, to connect with the present channel between said last-named bridge and Mount Washington Avenue bridge, to a depth of 16 feet below mean low water, and 50 feet in width at said depth, to the satisfaction of the Board.

On Aug. 12, 1897, the city of Boston submitted a petition for approval of plans for a bridge on the line of Dorchester Avenue across Fort Point Channel, as authorized by chapter 512 of the Acts of 1897, said bridge to be constructed under the provisions of chapter 516 of the Acts of 1896.

Under the authority conferred upon the Board by this act of 1897, such changes in the harbor line may be made by the Board as will, in its opinion, facilitate the construction of Dorchester Avenue, said bridge and draw, in an economical and proper manner.

At the hearing on this petition, given Aug. 19, 1897, certain owners of wharf property on the South Boston side

of the channel appeared in opposition to the approval of the plans presented, on the ground that their property would be injured. The hearing was continued to enable the city engineer to make further study as to grades. Plans have not as yet been approved.

On Sept. 2, 1897, the Board approved plans, under section 8, chapter 19 of the Public Statutes, submitted by the Boston Terminal Company for filling solid the tide-water area lying westerly of and adjoining the westerly side line of Dorchester Avenue extension, and between the southerly side line of Summer Street extension and the easterly side line of Federal Street, on condition that such bulkheads shall be built as may be required by the Board, to retain the filling. This approval and license was given "without waiving any of the rights of said Commonwealth to claim, demand and recover any and all damages suffered by the taking of land under the provisions of chapter 516 of the Acts of 1896."

On January 5, 1897, the Boston Terminal Company took certain tide-water lands of the Commonwealth in Fort Point Channel, within the harbor line established by chapter 170 of the Acts of 1880, and between the northerly side line of Summer Street extension and Federal Street bridge. Under various licenses granted by the Board during the past twenty-three years for the extension of wharves on Fort Point Channel within the above limit, the Commonwealth has received payment for its tide-water lands covered by these extensions, under the provisions of section 16 of chapter 19 of the Public Statutes. The receipts from this source are now paid into the harbor compensation fund for Boston harbor, under chapter 146 of the Acts of 1897. The claim of the Commonwealth for payment for its tide-water lands which the Boston Terminal Company has taken under chapter 516 of the Acts of 1896 has been placed in the hands of the Attorney-General.

On Sept. 3, 1897, the Board, under section 8 of chapter 19, Public Statutes, approved plans submitted by the city of Boston for a sea wall to be constructed on the harbor line on Fort Point Channel from the northerly side line of Summer Street extension to the easterly side line of Federal Street, and for filling in tide water within the lines of Summer Street

extension and Dorchester Avenue extension, as authorized and directed by chapter 516 of the Acts of 1896, the license for this work containing a provision for payment for tide water displaced.

South Bay.

As intimated in the report of last year, the exclusion of the business occupants of the wharves on Fort Point Channel, to give room for the new Southern Union Passenger Station, has stimulated the demand for wharf properties in other directions. Especially does this seem to have been the case in the upper part of Fort Point Channel and South Bay. At the southern end of the bay the Roxbury Central Wharf corporation has projected three piers and two docks, going out to the harbor line, which are to be occupied when built as lumber wharves.

The material for filling is to be taken from the bay. This will not only tend to improve the navigation therein, but will diminish the opportunity for it to become a nuisance. The project would seem to insure the future of the bay as an inland terminal for bulky coastwise products coming by water.

Mystic River.

July 14, 1897, the Board granted a license to the Boston & Maine Railroad corporation to fill flats and build a pile platform on Mystic River between its Western Division bridge and Mystic and Middlesex avenues in Somerville.

The petitioner desired to fill flats and build a pile platform beyond the pierhead and bulkhead line approved by the Secretary of War. This license was granted on condition that the licensee should dredge the whole of the area between the outer line of structures and the main navigable channel of Mystic River, and between its Western Division bridge and Middlesex Avenue bridge, excepting the area adjoining and 50 feet outside the lines of said Western Division and Middlesex Avenue bridges, to a depth of not less than 3 feet below mean low water, under the direction and supervision of the Board.

The proposed filling and structures beyond the United States pierhead line were approved by the Secretary of War.

The river at this point has a wide sweep or bend, with the main channel lying well over north of the middle line, and exhibits at low tide a wide area of unsightly flats. The advantages to be gained by lowering these flats to a plane of 3 feet below mean low water, both from the æsthetic as well as the utilitarian and sanitary point of view, more than compensates for the loss in the tidal prism at this spot.

Charles River.

The river Charles, both in its bed and on its banks, is undergoing gradual improvement in appearance and in usefulness. The project for improving the channel has been carried forward by the Federal government, so that it now is 200 feet wide and 7 feet deep at mean low water, from its mouth to Western Avenue bridge. Beyond that, as far up as the Arsenal Strect bridge, it has a least depth of 6 feet and a least width of 80 feet, and when the Market Street bridge shall be remodeled, the Congressional appropriation will permit of the channel being enlarged still farther up the river.

Meantime, the Metropolitan Park Commission and the Park Commission of Cambridge have acquired the larger part of the river bank, from Harvard bridge to Watertown, excepting such as, on account of the costly improvements, could not be readily controlled.

These possessions are being transformed into parks and boulevards as rapidly as circumstances will permit. The experiment of treating the banks during the past year by sloping and gravelling has been found successful and to be more attractive and less costly than stone bulkheads, such as are necessary or desirable below Harvard bridge.

Considerable quantities of gravel are found along the river bottom in different places belonging to the Commonwealth, and have been freely granted in the furtherance of the park improvement. While thus permitting of its appropriation to public uses, the corresponding benefit to navigation which accrues from deepening the bed of the river has not been lost sight of.

During the year the city of Cambridge, under the provisions of chapter 508 of the Acts of 1896, and the owners of

flats lying between West Boston bridge and the land of the Charles River Embankment Company, have combined in a project for improving their unsightly territory, and applied to the Board for licenses as their respective interests seem to require. Hearings were given by the Board, at which the mayor, city solicitor, members of the Park Commission and other leading citizens of Cambridge were present. Licenses, while temporarily delayed awaiting adjustments among the landowners, will issue to build a sea wall, enclosing the tidal basin in the rear, and to fill the same with material taken from the ugly flats lying between the site of the proposed sea wall and the channel of the river, with a view to lowering them below the plane of extreme low tide; and it was agreed that, in assessing compensation for tide water displaced by the work to be done, deduction should be made, yard for yard, for material used for said filling when taken from these flats.

The existence of a large bed of marketable gravel, having an area of about a million square feet contiguous to the proposed sea wall and extending nearly to the channel, stands in the way of immediate improvement of a considerable portion of these exposed flats. The efforts of the Board to have this material removed were resisted, on the ground that the gravel was too costly for the proposed filling, and insistence in that direction would imperil the whole project. After listening to a unanimous expression of the opinion on the part of the official representatives of Cambridge that leaving this area to be exposed for the present would be unobjectionable, and to the statement of the Park Commissioners that the gravel would be needed in the near future for surfacing the boulevards and grading and gravelling the river banks, in accordance with the projected requirements of the park system, the Board determined the depth and areas to be dredged, without encroaching on the gravel bed.

New Bedford.

The Board gave several hearings during the year on matters connected with the harbor of New Bedford, at which opposition to the granting of any license to fill flats out to the present harbor or channel line developed. The objec-

tions were based on the theory that, if all owners of flats were permitted to build solid to the present channel lines, under the provisions of chapter 18 of the Acts of 1806, as defined by chapter 269 of the Acts of 1848, the water across would become too contracted for the requirements of modern commerce, the character of which had so greatly changed during the past half century and the future of which was so uncertain; and that, while the Federal government was providing for the future by an additional width in the draw of the new bridge between New Bedford and Fairhaven, some steps ought to be taken toward withdrawing the present lines, in order still more to restrict encroachments into tide water. Out of this have grown suggestions for changing the channel or harbor lines or of establishing bulkhead and pierhead lines, beyond which neither solid filling nor structures should be authorized.

A hearing was given on June 22, on the petition of the county commissioners of Bristol County for approval of plans for the middle section of the bridge on Acushnet River between New Bedford and Fairhaven. A remonstrance was made against the approval of the plans in so far as showing a draw between Pope's and Fish islands. All parties were represented by counsel. Testimony was taken and arguments made. Subsequently an inspection of the locality was made by the Board. It appearing that the Federal government proposed to widen and deepen the channel in the line of the proposed draw, and favored the placing of a draw where planned, in view of the anticipation of increased commerce up the river, and for reasons of public convenience and of navigation, the Board approved the plans and ordered the license to issue.

Later, authority was granted allowing the street railway, running over the old bridge, and the city of New Bedford, respectively, to build temporary pile structures in connection with the destruction of the old and the building of the new bridge across the water between the two islands, with a view to diminishing, as far as might be, the inconvenience caused to public travel while building the new bridge in substitution of the old one.

Fall River.

The growing commerce at this port is keeping pace with the increase of the city in population and manufacturing industry, and is demanding additional wharf accommodations. As no harbor line has been established here to determine the limits of encroachment into tide water, it will become desirable at no distant day to place a restriction upon the erection of structures therein.

Green Harbor.

Any consideration of the questions which might have arisen had the Board been called upon to act under the provisions of chapter 495 of the Acts of 1896, in removing the dam and dike at Green Harbor, becomes unnecessary, in view of the unanimous conclusion of the Joint Board that it will report against such removal. It would seem as if the instructions to this Board to make a report were intended to operate only in case the determination of the Joint Board should be in favor of removal; and, inasmuch as the Joint Board will make a full report of its findings, any report from this Board covering the same ground and reaching the same conclusions would be superfluous.

Osterville and Cotuit Harbors.

By chapter 483, Acts of 1897, the Board was instructed to cause an examination to be made by competent engineers of the waters of Osterville and Cotuit bays, for the purpose of determining whether a channel for the passage of vessels might be cut through the beach between South Bay and Vineyard Sound without injury to Cotuit harbor; and the sum of $8,500 was appropriated to defray the expense of the survey and of the cutting of the channel and attendant damages, in case the Board should find it could be done without injury to Cotuit.

The Board directed its engineer to take immediate steps for a thorough examination and survey of the premises, and to report thereon as soon as practicable.

Subsequently the Board gave hearings on the subject at Cotuit on September 9, at which some fifty-nine of the

citizens and summer residents were present, and on September 10 at Osterville, when some sixty-six of those interested were in attendance.

It appeared that the average amount of business of Cotuit from oysters, quahaugs and cord wood was about $22,000, to which must be added the proceeds of the sale of about 425 tons of coal and 150,000 feet of lumber. There is a large summer population, resident not only at Cotuit but all along the shore to and beyond Osterville, who use and enjoy the waters of all the bays which empty through Cotuit harbor into the Sound.

No voice was heard to express a desire for the proposed channel, if it were likely to result in shoaling Cotuit bar off the entrance to the harbor. The proposed channel would be used largely by fishing boats and pleasure yachts from Osterville, which now are obliged to sail down through North Bay, the Narrows and Cotuit Bay, a distance of 4½ miles, before entering the Sound.

The report * of the engineer shows an exhaustive examination of the locality, covering not only the inland waters of Osterville and Cotuit, but extending into the Sound for some distance along the shore. To enable the engineer to draw safe and satisfactory conclusions, it was necessary to determine and occupy triangulation stations, to survey shore lines, to run lines of levels and take soundings, to establish tide gauges and mathematically observe full tides and high and low waters, all of which doings covered a period of some ten weeks of field work by a corps of engineers and assistants, besides a month in the office working up the results. A detail of this work will appear in his report.

The report finds Cotuit Bay with an area of about 295 acres, forming the harbor of Cotuit; next above that are the Narrows, so called, with an area of about 127 acres; above that again is North Bay, having an area of about 326 acres, with the village of Osterville lying at its easterly end; southerly of and connected with this is South Bay, with an area of about 334 acres, through which, and a cut excavated through the sand beach, Osterville inhabitants desire to find

* See Appendix A.

a nearer passage to the Sound. The depth of navigable water generally throughout these areas varies from about 4 to 6 feet, though in some places it is deeper. The southerly portion of South Bay, however, where it is proposed that the cut should be made, is very shallow, in some places not even one foot.

In passing through Cotuit Bay and the Sound, the waters of each tide follow several channels, of which the middle one (the more direct course between Sampson's and Gull islands) finds the bar wider and carrying but from $2\frac{1}{2}$ to 3 feet at mean low water; while the Rushy Marsh channel takes a more circuitous course, hugging the shore on the west, and making a shorter distance over the bar, where the depth at mean low water is about $3\frac{1}{2}$ feet. While the evidence showed that the depth of water on the bar had not varied materially during the past fifty years, the direction and width of the channels have met with considerable changes. The eastern channel has been practically closed by the growing extension of Dead Neck beach westerly toward the southerly end of Sampson's Island. The middle channel has been broadened and shoaled by the wearing away of Gull Island, and, while there is apparently a slight increase in depth, according to the testimony the channel is growing over what once was Gull Island; and, while earth and lighter material have been washed away and distributed in the harbor and adjacent areas, bowlders have remained, sinking as the soil was washed away from underneath them, but leaving them a dangerous and unseen obstruction to safe navigation.

The western or Rushy Marsh channel is not only narrow and crooked, but, owing to the trend of drifting material westerly from Gull Island and from the Popponesset shore north-easterly, is growing gradually narrower, and navigation in that channel after nightfall is hazardous, if not impracticable. As a consequence, vessels caught out at low ebb tide after nightfall find it dangerous to attempt to make the harbor by way of any of the existing channels. In addition to this, many of the former deep areas are fast filling with the drifting sands. The changed conditions are attributable to the gradual washing away of the headlands and islands and the drift material carried along the shore.

There can be no doubt that the channels at the entrance of Cotuit harbor, such as they are, owe their preservation to the rapid current during the last half of the ebb tide.

If it shall be ascertained that the volume and velocity of the ebb tide will be unaffected by digging a cut of given dimensions from South Bay to the Sound, there will be safe reason to believe that such a cut can in no way do an injury to Cotuit harbor.

The main question to be determined then is to what extent "the volume and velocity of the tidal flow through the Cotuit entrance would be affected, providing such a cut should be made through the beach from the South Bay as would create a navigable channel for boats drawing in the neighborhood of 3 or 4 feet."

The report gives the areas in square feet of the various sheets of water contributing to the flow through the entrance of Cotuit harbor; also the mean range of tide and the mean tidal volume in cubic feet of each area. From these data we find that the mean range of tide in Cotuit Bay is 34¼ inches, while in South Bay it is but 25¾ inches. The mean range of the tide in the Sound in this locality is about 3 feet. The area of South Bay is 14,570,000 square feet.

The difference between the mean range of tide therein and in Cotuit Bay is 8½ inches, notwithstanding Sepuit River affords an entrance and exit for tide water at the southerly end. The difference of 8½ inches in the mean range of tide over the area of South Bay will supply a volume of water adequate to preserve a channel of the dimensions calculated through the beach, without in the least diminishing the volume of water that will continue to flow through Cotuit Bay or retarding the velocity of its flow.

This conclusion disposes of the question of injury to Cotuit Bay, and leads to the consideration of the locality where the cut should be made and the means by which it should be effected and preserved, as well as to the dimensions of the cut itself.

If the excavation should be made on the east side of Dead Neck, it was claimed at the hearing at Osterville that a demand for damages would be made for separating it from Wianno. The amount of damages which could be proved is

of course doubtful, but could be wholly avoided by making the proposed cut on the west side of Dead Neck, unless the east side should prove the better location.

A careful view of the situation discloses but little superiority of one place over the other, but such as exists seems to be in favor of the west side. The cut is desired largely for the use of sail boats. On the east side of the neck there would be a narrow water-way, from which for more than half way up to the bridge at Osterville the wind from the west and north-west would be cut off by the high land and trees on the neck; whereas, on the west side of the neck there is an uninterrupted opportunity for the enjoyment of these breezes, as well as those from the south-west, which latter, as is well known, are the prevailing winds on that coast in the summer season. Under all the circumstances the west side has been selected as the most suitable place for the cut. It is shown on the accompanying plan, printed in the Appendix.

Owing to the slight rise and fall of the tide and the constant drift along the shore, it would be exceedingly unwise to make a cut through the beach without protecting it by jetties carried out to a depth of 3 to 4 feet at mean low water; otherwise shoaling and bars would be likely to form on the outside, and the purpose of the cut would be defeated.

A calculation of the cost attendant upon this project has somewhat exceeded the allowance for that purpose made by the last Legislature. It would be necessary to cut a channel 2,850 feet long into South Bay, before finding depth of water sufficient to float the ordinary sail boat. This channel, to be convenient and serviceable, should have a main width of 100 feet. It should begin on the three-foot curve at the south end of the bay, and be carried directly through the beach to a depth between the three and four-foot curve in the Sound. Through the beach and out into the Sound it should be protected by wooden bulkheads and pile and timber jetties. The least expenditure required to accomplish this is estimated to be $8,250 for the necessary excavations on land and under the water, and $5,639 for the oak piles, spruce timber, bolts, nails and labor necessary for the struct-

ure. These sums together make $13,889, or more than double the amount the Board has on hand for the work projected.

It was at first proposed to make the cut through the beach 175 feet wide and 3 feet deep, because it had been found that the surplus tidal prism of water in South Bay would permit of a cut of these dimensions without danger of affecting the volume or rapidity of the flow of water through Cotuit harbor, and it was intended to supplement this cut by one 200 feet wide within South Bay. It was found, however, that the estimated cost for excavations alone would amount to $16,500.

Upon mature consideration of the needs of the Osterville people, and the purposes for and conditions under which this outlet will be used, the Board is satisfied that sufficient accommodation will be afforded by a cut 100 feet wide, and, as that will reduce the required expenditure by $8,000, it is thought that the smaller channel ought to satisfy all requirements.

If this and other boat harbors or inlets are to be constructed along our sandy coast, it must be realized in the beginning that the first cost is considerable, in order to ensure a permanent character to the project. The cost of dredging the inlet is one-half the entire expense in this case; but, without the protection afforded by the additional cost, it would soon be of little value, and the outlet liable to be closed up by the violence of a storm.

Of the $2,000 specially appropriated for survey and examination of the locality out of the $8,500 generally appropriated under the act, the sum of $1,929.53 has been expended. An additional appropriation of $7,500 would enable the Board to excavate the cut and build the jetties under the estimates already given.

Boundary Line between Gay Head and Chilmark.

In the last report (page 19) are narrated the doings of the Board under the provisions of chapter 187 of the Acts of 1896, for the purpose of determining the boundary line between the above-named towns, a description of the line by courses and bounds and the recommendations relating thereto.

By chapter 323 of the Acts of 1897 the boundary line thus defined was established, and the Board was directed to locate and mark the line by setting stone bounds wherever required; and also, whenever one or both of said towns or one or more of the inhabitants of said towns should agree, with such sureties as are satisfactory to the Board, to close the existing outlet of Menamsha Pond and excavate a new one through the beach on said boundary line, subject to the approval of the Board, then the Board is authorized to build suitable protection to the banks on either side of said outlet for the purpose of marking the boundary line at this place, and $2,000 was appropriated for carrying out the work.

In June were made the necessary surveys for determining the location of the bounds necessary to mark the line, and arrangements were completed for the sum of $12 to have new monuments prepared and set at two points, — one near the old wharf at Menamsha Inlet and one on the island between that and the outlet. These were to mark that portion of the line which was established on the recommendation of the Board. Upon making the surveys, it was found that the mouth of the inlet had moved since the date of the surveys of the previous year about 150 feet to the westward, and was then substantially on the boundary line, so that all that was necessary to do to mark the line at this point was to build the protection to the banks which was authorized by the statute.

After due study, plans and specifications were prepared for building two pile and timber jetties, one on either side of the mouth of the outlet, 125 feet apart and extending about 400 feet into the sound to where the water was about 10 feet deep at low tide; and proposals for building the same were invited, to be opened on July 28, 1897. Two proposals were received, one of Chas. E. Davis of New Bedford for $3,290, the other of B. C. Cromwell, Jr., of Vineyard Haven, for $5,000. As both these amounts largely exceeded the sum appropriated by the Legislature for the work, they were necessarily rejected.

The advisability of so modifying the protection works that they could be built within the appropriation was then considered; but after consultation with the engineer it was

finally decided that it would be inexpedient to make any change, inasmuch as the works as originally designed were the least expensive that could be constructed in that place, with reasonable expectation of making a fairly permanent improvement.

The setting of the monuments to mark the other portion of the line has been completed, and a plan showing the location of the line and bounds has been prepared ready to be filed with the Secretary of the Commonwealth and in the registry of deeds for the county of Dukes County, as required by the statute.

Of the $2,000 appropriated last year, the sum of $136.40 has been expended in the foregoing work, leaving a balance available for jetties of $1,863.60.

If it shall be the will of the Legislature to make permanent the outlet by building the proposed jetties, an additional appropriation of $2,000 will be required.

It is worthy of consideration that the proposed permanent outlet would provide an accessible harbor for vessels drawing not over 6 feet of water at a point in Vineyard Sound where such a harbor is very much needed. Beside the advantage to the settlements at Gay Head and Chilmark, it would afford a safe and convenient harbor of refuge for the many yachts and sail boats which in the summer months frequent the Sound. In case of sudden stress of weather, with the wind from the northward or eastward, Holmes Hole and Vineyard Haven might often be found to be remote and inaccessible, whereas a refuge at Menamsha would prove a haven of easy access.

Boat Harbors.

The New England coast offers a healthful summer climate, and its attractions bring hither families from all parts of the country; but, while both the population and the wealth of the nation are increasing, the coast line remains fixed, consequently every year sees new settlements crowding the points and bays available for camps and cottages.

This summer occupation brings and distributes among the smaller seaports and coast villages an almost incredible amount of money, and has without doubt preserved many a New England town from absolute decay. A recent statistical

computation made by official authority of the State of Maine gave $10,000,000 as the sum of money left within the borders of that State by the annual tide of summer travel and residence.

The seashore of the Commonwealth, with the exception of a comparatively few rocky bays and promontories, presents a front of sandy slopes and dunes, constantly shifting by the action of currents, winds and tides. For long distances the coast line is low and the approaches are shallow, while behind are reaches of water separated from the ocean by narrow necks of sand, through which streams flow from time to time in different places and in varying depths, under changing conditions disturbed by the elements of nature. What once were good entrance channels and harbors, amply sufficient for schooners of the coasting trader, now departed, are often at the present day not more than percolating rivulets, meandering a sinuous course through the sand bars, and hardly deep enough at ordinary low water to float the shallowest skiff.

Behind these entrances are, in many cases, an ancient village, revived, repainted and prospering, owing to the advent of the summer visitor; or a cluster of new cottages, the nucleus of a growing settlement. Out of this new condition or situation springs a desire for a safer entrance to the harbor, that may be availed of in case of sudden change of weather or at any stage of the tide. It is needed to protect the life and property of the fisherman, as well as the sojourner seeking for health and pleasure.

The policy of the Federal government is declared against appropriations for the improvement of harbors where no local commerce exists, and consequently any relief to be afforded in that direction will have to come from the action of the Commonwealth in such cases as may seem of sufficient importance to deserve assistance.

Garbage Deposits in Tide Water.

Complaints have been made to the Board from time to time of unsightly conditions on the surface waters of Boston harbor and Massachusetts Bay and along the shores of the high-water line between Nahant on the north and Scituate on

the south, caused by the deposit of the garbage of the city of Boston in the tide waters of the Commonwealth outside Boston Light.

The proper disposition of the garbage of great cities has long been a difficult problem, and has occasioned much thought and experimentation. The city of Boston solved it for the time being by carrying her garbage out to sea and dumping it in the bay. A considerable portion sinks, but a considerable portion also floats upon the surface. That which floats is a noisome sight, and by the action of the winds, the waves and the tides is often carried along and finally deposited upon the shore line of the uplands making down to the sea. In the summer season the beaches and rocks lying between Nahant and Scituate are the resort of the public in the pursuit of health and recreation, of which the enjoyment of sea bathing forms a not inconsiderable part. These offensive accumulations have a deterring effect on the mind of the would-be bather, and thus diminish his enjoyment of his rights and privileges at the seashore. The annoyance and offensiveness of this condition of affairs is too obvious to dwell upon.

Individual citizens, corporations and the Commonwealth have spent generous sums of money for the purpose of encouraging the enjoyments of the seashore, whereby increased health and happiness are promoted. The Metropolitan Park Commission alone has done much to render Revere Beach attractive and to forward the interests of the bathers.

It is admitted that the sanitation of the city is the foremost consideration, and that the interests of the few are to be sacrificed in the interests of the many, whenever that is the only alternative; but, since the temporary solution by Boston of the disposition of its garbage by taking it to sea, science has been at work making many experiments, and its disposal by either crematory or reduction processes is no longer tentative.

In the light of the advancement in science, it no longer seems reasonable that municipalities should be permitted to create nuisances in the disposal of garbage in the tide waters of the Commonwealth.

Boundary Line between the Towns of Wareham and Marion.

Pursuant to the provisions of chapter 302 of the Acts of 1897, the Board, accompanied by its engineer, the selectmen of the town of Wareham and the selectmen of the town of Marion, met on the ground and located and caused the portion of said lines south and east of the mouth of Weweantit River to be located and defined by range marks placed on the shores, and subsequently approved the monument to mark the bounds and the inscription to be placed thereon.

Province Lands.

Continuing the policy which the Commonwealth determined on after the able report of the Trustees of Public Reservations, made to the Legislature in 1893, the sum of $3,500 was appropriated last winter for the purpose of carrying on the work of reclaiming these lands, and of preventing further liability to injury from the blowing sands.

During the planting season of the past year, through April, June, September and November, the large number of 42 acres have been planted with beach grass, among which has been thickly interspersed small trees and shrubs, transplanted from the nursery. In addition to this, acorns, the seed of pine and other trees have been sown broadcast as the grass was planted; and, as this seed readily germinates and grows rapidly in this soil, we look forward to a forest growth to cover these outer dunes in the not far distant future. The number of trees and shrubs transplanted during the season, of different varieties, is not far from 36,500. Of these, about half were yearlings and the other half had from two to three years growth. The latter were all pines of different varieties.

There has also been planted, on the grassed slopes covered in the years 1895 and 1896, some 30 acres with the seed of the various kinds of pines. Some 400 feet of the road in the direction of the Race Point Life Saving Station has been added. This is a much-travelled way, of increasing use to the inhabitants; and the Board hope, by gradual ex-

tensions at such times as planting is inadmissible, to advance it economically toward completion.

It is gratifying to be able to report that not a single breach among the vegetation has occurred since the plantings, and that no movement of sand is apparent in the plantations, thus showing effectual control of the former action of the winds. The same appropriation continued for a few years longer will remove all apprehension of danger from a movement of the sands.

In accepting the resignation of Mr. Leonard W. Ross, as landscape forester, an expression of the appreciation of the Board for his valuable services, rendered gratuitously, throughout the experimental stages of reclamation of the Province Lands, up to the present time, is due. His election as a member of the Legislature has now led him to resign his connection with the Board.

The report * of the Superintendent of the Province Lands, gives a detailed account of the work accomplished during the year.

Wrecks.

The contract for the removal of the wreck of the steamship "Venetian," abandoned to the Commonwealth by both owners and underwriters, made July 30, 1895, with George W. Townsend, was completed by its final removal from the channel Sept. 28, 1897. The boilers had been placed on the flats in the vicinity of Governor's Island, where they were later broken up and the material removed. On Oct. 31, 1897, Mr. Townsend, as agent for the Commonwealth, reported that he had sold material to the amount of $30,916 55, and that he had material unsold to the value of $1,723.80, which he would buy of the Commonwealth at that price, and, it being a fair valuation, his offer was accepted. By the terms of the contract, one per cent. of the proceeds of the sale of the material belonged to the Commonwealth, the other ninety-nine per cent. being the compensation which the contractor was to receive for his work. A bill of sale was given Mr. Townsend of the material on hand at the above valuation, and he paid into the treasury the sum of $326.39,

* See Appendix E.

which was one per cent. of the total proceeds of the sale of the material from the wreck.

Other wrecks removed by the Commonwealth during the year were the "W. F. Miller" of Barnstable, a small wood schooner which was wrecked at the entrance to Cotuit harbor, and the yacht "Galena."

The "W. F. Miller" was removed, under contract * with Charles E. Davis of New Bedford, for the sum of $250, he being the lowest bidder, the material being placed on the beach near by, with the consent of the owner thereof.

The sloop yacht "Galena" was sunk in the channel on the northerly side of the "lower middle" in Boston harbor by collision with the steamer "Cape Ann." She was removed, under contract † with George W. Townsend, for $49, he being the lowest bidder. She was taken up bodily and placed on the filled portion of the Commonwealth's flats at South Boston.

The steamer "Lillie" was partially burned on the morning of Sept. 13, 1897, at Sagamore Hill in Hull, and the wreck was complained of as liable to become an obstruction to safe and convenient navigation in Hingham Bay. After some correspondence with the owner and the insurers, the owner undertook to remove her.

Back Bay Lands.

The encroachment of business into the residence section of the Back Bay has led to a change in the character of buildings, and to a desire for a release from some of the restrictions imposed by the Commonwealth on that locality when laid out with reference to a contemplated residence section of the city.

On the 12th of March, 1897, the Board considered a petition from the Boston and Roxbury Mill Corporation, asking for a release from the operation of a mortgage given to the Commonwealth June 9, 1854, and recorded with Suffolk Deeds, lib. 665, fol. 152, on two parcels of land bounding on Commonwealth Avenue and adjacent to what was formerly known as Heath Marsh, in order to enable it to give a clear title to the Riverbank Improvement Company, the purchaser of the same.

* See Appendix G. † See Appendix H.

After becoming satisfied that the Commonwealth had other and sufficient security that every part of the plan to secure the performance of which said mortgage was given would be fully completed and finally carried into effect, the Board approved the request of the Boston and Roxbury Mill Corporation, and thereupon a release was executed by the Treasurer of the Commonwealth.

On the 14th of September, the petition of the Boston and Roxbury Mill Corporation was considered, and certain private ways laid out over the parcel of land at the corner of Deerfield Street and Bay State Road, on land hitherto unimproved, were modified by changing the locations of the said private ways or back alleys thereon, with a view to giving increased accommodation and value to the abutting land.

Great Ponds.

The questions arising during the past year under the provisions of chapter 318 of the Acts of 1888, giving jurisdiction to this Board over great ponds, have been both novel and important; among them were the following: —

On June 16, 1897, the New Bedford Water Board petitioned for approval of plans for a dam between Great Quittacus and Pocksha ponds in Bristol County, by authority of chapter 345, Statutes of 1894. On July 7, 1897, the Board gave a hearing on this petition, the petitioner and the towns of Middleborough and Lakeville being represented by counsel.

It was objected at the hearing (1) that in the taking the water Board had transcended its powers; (2) that, in case a license should be granted, a fish-way and a boat-way over the dam or otherwise should be provided and gates for obstructing the flow of water should be constructed. After hearing the evidence and arguments, the Board reached the following conclusion: —

That the petitioners were authorized by the act of the Legislature to construct a dam between the two ponds, and that, having done the acts contemplated as preliminary to the filing of the present petition, it is not within the province of the Harbor and Land Commissioners to inquire whether in so doing the authority of the legislative grant in the taking of land and water contem-

plated therein has or has not been exceeded, and consequently it is neither necessary nor advisable to determine that question.

It has long been the policy of the Commonwealth to secure to the inhabitants of large towns and cities a pure water supply for drinking, domestic and municipal purposes, by appropriating to such uses the waters of great ponds exclusive of all other public rights and uses. The Legislature has granted these rights and the courts have maintained these grants on the grounds that lesser and inferior public rights and privileges must yield to more urgent demands of greater exigency. Purity of water supply is essential to the health of a community, and the condition surrounding any given situation upon which such purity depends must be determined by scientific considerations under the action of local authorities.

The act in question authorizes the building of a dam between the two ponds, and contemplates the possibility of a permanently lower level in greater Quittacus. The right to maintain such lower level permanently is beyond question. No provision is made for fish-ways or boat communication between the ponds. This Board has no right to interpolate them into the statute.

The plans presented are apt and adequate for the preservation of the conditions required by the act and appropriately designed to serve the purposes intended. They accordingly meet the approval of this Board, and the license will issue as requested.

On June 24 a petition for lease of an island in Washacum Lake in Sterling was received, which the Board declined to grant, on the ground that Washacum Lake empties into the proposed reservoir on the Nashua River, under the control of the Metropolitan Water Board, and it was thought best not to take the risk of any possible pollution of the lake by permitting any one to occupy the island in question.

On July 8 a hearing was given on the petition of the city of Worcester for license to build a bridge in substitution of a portion of the causeway across Lake Quinsigamond. The bridge was designed with an arched span in the centre 70 feet wide, flanked by two smaller ones on either side with a span of 40 feet each. Objections were made to the granting of the license on several grounds of a more or less technical nature, not properly to be determined by this tribunal; also upon the ground that, if a bridge were to be built, it should be of iron or steel, and more expensive than the one proposed.

The Board, however, were satisfied that the mayor and others representing the cities interested were entitled to proceed so far as the license from this Board could afford them the opportunity, and that validity of the objections offered could be raised and settled by the tribunal properly constituted for the determination of questions of that character without prejudice, if a license were granted; and, if a license were refused, a proposed public benefit might be defeated without just reason. Consequently the license issued.

Connecticut River.

The general care and supervision of the Connecticut River and its banks were given to the Board by chapter 344 of the Acts of 1885. Between 1888 and the present time a number of appropriations have been made for protecting the banks at Hadley, West Springfield and Agawam. All work of this character for which appropriation was made has now been completed, with the exception of a trifling amount remaining to be done at Agawam. By chapter 58 of the Resolves of 1897 an appropriation of $1,500 was made for completing the protection of the Agawam bank.

The work this year has been done, as heretofore, under the immediate supervision of Mr. E. C. Davis of Northampton, civil engineer, to the entire satisfaction of the Board. He has employed laborers and contractors, and worked in conjunction and harmony with the selectmen of Agawam. The report * of the engineer shows all necessary details.

Up to 1896 no appropriation had been made for the general survey authorized by the act of 1885. In 1896 an appropriation of $1,000 was made for beginning this survey. Under this appropriation about 6½ miles of the river have been surveyed, based on the triangulation done under the direction of the Topographical Survey Commission. The maps required by the statutes to be filed at the registry of deeds will be made during the coming winter. A small continuing appropriation each year would enable this work to be carried on in the most economical manner. For the general character of and necessity for this work, reference is respectfully made to pages 35 and 36 of the last annual report.

* See Appendix F.

Work of the United States in Rivers and Harbors of the Commonwealth.

The following statements, made by Lieut.-Col. Samuel M. Mansfield, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts, and by Maj. D. W. Lockwood, Corps of Engineers, U. S. A., who is in charge of similar improvements in southern Massachusetts, show the work accomplished by the United States government in the rivers and harbors of this Commonwealth during the year: —

Statement of Lieut.-Col. S. M. Mansfield, Corps of Engineers, U. S. A.

Dec. 31, 1897.

The Harbor and Land Commissioners, Commonwealth of Massachusetts, Boston, Mass.

Gentlemen: —In accordance with your request of the 3d inst., I have the honor to furnish the following summary of the work done by the United States during the year 1897, in the rivers and harbors of Massachusetts which are under my charge: —

Newburyport Harbor.

The project for the improvement of the harbor has not been changed. The river and harbor act of June 3, 1896, appropriated $16,000 for the harbor. During the year 13,002 tons of rubble-stone were deposited in the south jetty under a contract with the Rockport, Pigeon Hill and Cape Ann Granite companies. It is now about 1,800 feet long.

The annual survey of the bar, made in June, 1897, developed two distinctive channels through the bar, of about equal width and depth, one channel directly east from the mouth of the river, the other extending southward along the shore of Plum Island.

Since the survey was made the south jetty has been extended 250 feet, and it is expected that the next survey will show the effect of the extension in the further development of the easterly channel.

Harbor of Refuge, Sandy Bay.

The project remains unchanged. The act of June 3, 1896, appropriated $150,000 for this improvement, and this sum will be expended in continuing the building of the substructure of the breakwater.

During the year operations were continued under two contracts, one with the Cape Ann Granite Company, the other with the Rockport, Pigeon Hill and Cape Ann Granite companies. Under the first contract 125,600 tons, and under the second 84,232 tons, of rubblestone were deposited in extension of the substructure of the breakwater.

Gloucester Harbor.

No change in the project has been made. The act of June 3, 1896, appropriated $34,000 for this harbor. Of this sum, $2,000 was expended in the summer of 1897, in removing a pinnacle rock in the outer harbor, south-west of Ten Pound Island Ledge, to a least depth of 16 feet at mean low water, and five projecting points of rock near the ferry landing at Rocky Neck, in the inner harbor, to the level of the surrounding bottom. The remaining $32,000 will be expended in the extension of the substructure of the Eastern Point breakwater, under a contract with the Rockport, Pigeon Hill and Cape Ann Granite companies. Under this contract 23,456 tons of rubblestone were deposited in the breakwater during the year.

Manchester Harbor.

Under provisions in the river and harbor act of June 3, 1896, a project of improvement of this harbor was prepared and submitted on July 30, 1897, providing for dredging the natural channel to a depth of 6 feet at mean low water, 100 feet wide at the entrance and at sharp bends, at least 75 feet wide throughout, with two turning or anchorage basins, one just below the Boston & Maine Railroad bridge, the other abreast of the town landing.

The estimated cost of this improvement is $25,000.

Lynn Harbor.

No change has been made in the project. The act of June 3, 1896, appropriated $20,000 for continuation of the improvement.

As much as was necessary of this amount was expended during the year in completing the project of dredging. The inner main ship channel was widened to 200 feet, 10 feet deep at mean low water; 54,092 cubic yards were dredged from the channel, under a contract with Mr. Augustus B. Martin; and the inner and outer main ship channels are now 10 feet deep at mean low water and 200 feet wide throughout.

Nothing more remains to be done under the project but the construction of the training wall to aid in keeping the outer channel open, and the necessity for this wall is not yet apparent.

Boston Harbor.

No change has been made in the project for its improvement. Operations were continued during the year, under the contract with Messrs. Townsend & Johnston, for the removal of the ledges uncovered by dredging done in the lower main ship channel, and the contract was completed in November, 1897. There were 4,951 cubic yards of ledge removed during the year, and the completion of the contract secures the full use of the lower main ship channel so far as it has been completed.

The act of June 3, 1896, appropriated $70,000 for the harbor, as follows: "Improving harbor at Boston, Massachusetts; continuing improvement, seventy thousand dollars: *provided*, that this sum may, in the discretion of the Secretary of War, be used in the preservation and improvement of said harbor, including the project for improving the main ship channel, and that seven thousand dollars of this sum may, in the discretion of the Secretary of War, be used in improving Chelsea Creek, and so much thereof as the Secretary of War in his discretion shall direct to be expended for the protection of Great Head, Winthrop, to prevent the further washing away by the action of the sea: *provided*, that contracts may be entered into by the Secretary of War for such materials and work as may be necessary to carry out the revised project of August eleventh, eighteen hundred and ninety-two, such contracts to provide that said ship channel shall be widened to a minimum width of one thousand feet and a minimum depth of twenty-seven feet, to be paid for as appropriations may from time to time be made by law, in the aggregate not to exceed one million one hundred and forty-five thousand dollars, exclusive of amount herein and heretofore appropriated."

The $7,000 allotted for Chelsea Creek has been expended under a contract with the Eastern Dredging Company. The project of improvement of this channel provides for a channel 150 feet wide, 18 feet deep at mean high water to the head of navigation, at an estimated cost of $65,000. There were 22,236 cubic yards dredged in making the improved channel 14 feet deep at mean high water, at least 35 feet wide.

The Secretary of War decided to expend no part of the appropriation of June 3, 1896, for the protection of Great Head, Winthrop, and the balance of $63,000 will be used to cover cost of supervision of the continuing contract for the improvement of the main ship channel.

On Feb. 11, 1897, a contract was entered into with Messrs.

Breymann Brothers of Toledo, O., to dredge 2,910,718 cubic yards, more or less, of material from and in completion of the proposed main ship channel, the contract to be completed on or before June 30, 1900.

The sundry civil act of June 4, 1897, appropriated $400,000 for this work, but active operations were delayed while the contractors were engaged in assembling their plant, and not commenced until November, when one dredge of large capacity was placed on the work in the lower main ship channel; only about 60,000 cubic yards have been dredged to date, and the operations as yet have resulted in no well-defined improvement over the former condition of the channel.

The river and harbor act of June 3, 1896, provided for a survey of Boston harbor, "with a view to securing a channel one thousand two hundred feet wide and thirty feet deep from the navy yard to the entrance of the present main ship channel, and from the main ship channel in President Roads through the Broad Sound Channel."

A survey of the Broad Sound Channel was made in the summer of 1897, and on Nov. 19, 1897, a project was submitted for a channel 30 feet deep, 1,200 feet wide, in accordance with the above provision.

The estimated cost of the project after the channel 1,000 by 27 feet has been completed was, for the channel from the Navy Yard to President Roads, $1,644,553.90; from President Roads through the Broad Sound Channel, $481,941.57; from President Roads to the entrance of the present main ship channel, $1,557,621.72; total, $3,684,117.19.

Scituate Harbor.

No change has been made in the project of improvement. The $6,000 appropriated by the act of June 3, 1896, was expended during the year, under a contract with the Eastern Dredging Company, in deepening the entrance channel from 5 feet to 7 feet at mean low water, with a least width of 100 feet.

Plymouth Harbor.

Repairs and extensions to the bulkheads protecting Long Beach in the vicinity of the "Pavilion" were made during the year.

Wellfleet Harbor.

No change during the year.

Provincetown Harbor.

The bulkhead protecting the narrow stretch of beach near Wood End Light was strengthened by extending the upper bulkhead 225 feet to the eastward.

Chatham Harbor.

No change has been made in the condition of the harbor during the year.

Merrimac River.

During the year about 205 tons of bowlders were removed from the channel of the river below Rocks Bridge.

On May 5, 1897, an estimate of cost of a channel 150 feet wide and 7 feet deep at mean low water, from Newburyport to Haverhill, was submitted, in accordance with the river and harbor act of June 3, 1897. The cost of this improvement was estimated to be $171,442.70.

Powow River.

During the year operations were concluded under a contract with the Eastern Dredging Company to dredge 25,000 cubic yards of material from the river.

The channel is now 12 feet deep at mean high water, at least 30 feet wide throughout, and is 45 feet wide for a length of 3,252 feet from its upper end.

Essex River.

Five thousand dollars was appropriated for this river by the river and harbor act of June 3, 1896. This sum was expended during the year, under a contract with the Eastern Dredging Company, in widening the upper part of the channel from the highway bridge downward for a distance of about 4,400 feet to its full projected width of 60 feet, 4 feet deep at mean low water.

Mystic and Malden Rivers.

The sum of $10,000, appropriated by the river and harbor act of June 3, 1896, was expended during the year, under a contract with Mr. Augustus B. Martin, in completing the channel in Malden River below the first bridge, 100 feet wide and 12 feet deep at mean high water; and in Mystic River, by extending the proposed channel of full width and depth for a distance of 4,000 feet, or to within 6,200 feet of the head of navigation.

Town River.

No change has been made in the project. The river and harbor act of June 3, 1896, appropriated $10,000 for this improvement, which was expended during the year in dredging the channel 50 feet wide and 4 feet deep at mean low water from the mouth to Johnson's wharf, in Quincy, and 30 feet wide from Johnson's wharf to the stone yard wharf.

Weymouth River.

The sum of $5,000 available for Weymouth (Fore) River at the beginning of the year has been expended in completing as far as possible the full proposed improvement in the upper part of the channel. This channel is now completed above Braintree bridge, and below the bridge it is at least 60 feet wide and 6 feet deep at mean low water.

The project for Weymouth (Back) River proposed to dredge a channel 200 feet wide and 12 feet deep at mean low water through the outer bar and up to the Fertilizer Company's wharf. The sum of $12,500 available for this improvement at the beginning of the year has been expended in completing the channel through the bar, and in dredging it at least 100 feet wide and 12 feet deep at mean low water to the Fertilizer Company's wharf.

Wrecks.

The wreck of the schooner "Annie E. Rudolph," located about 2½ miles east by north of Orleans, Cape Cod, Mass., was removed under a contract with Mr. L. E. Lunt.

Examinations and Surveys.

The act of June 3, 1896, provided for surveys and projects for the improvement of the following: —

Merrimac River, from Lowell to New Hampshire State line.

Marblehead harbor, with a view to improving the harbor by building a sea-wall to protect the isthmus connecting Marblehead Neck with the town of Marblehead.

Provincetown harbor, with a view of erecting a dike for the protection of that harbor.

Neponset River.

Lynn harbor, with a view to securing a channel 300 feet wide and 15 feet deep at low water.

Boston harbor, with a view to securing a channel 1,200 feet wide and 30 feet deep from the Navy Yard to the entrance of the

present main ship channel, and from the main ship channel in President Roads through Broad Sound Channel.

Manchester harbor.

Harbor at Plymouth.

Weymouth Back River, from Hingham bridge to Mann's wharf.

With the exception of the Merrimac River and Boston harbor, these surveys were made in the fall of 1896; and the reports thereon have been submitted under the following dates: Marblehead harbor, Feb. 4, 1897; Provincetown harbor, March 10, 1897; Neponset River, April 17, 1897; Lynn harbor, March 29, 1897; Manchester harbor, April 7, 1897; harbor at Plymouth, April 24, 1897; Weymouth Back River, March 15, 1897.

A survey of Broad Sound was made during the summer and fall of 1897, and a report and project were submitted on Nov. 19, 1897.

The survey of Merrimac River, from Lowell to New Hampshire State line, was made in November and December, and the notes are being plotted.

Preliminary examinations and reports at the following localities were also ordered: —

Gurnet Rock and other rocks at mouth of Plymouth harbor.

Duxbury beach, with view to protection of harbor.

Duxbury harbor, with view to widening and deepening improvement.

The approaches to the Cape Cod Ship canal.

The above examinations were made in 1896, and reports thereon have been submitted under the following dates: Gurnet Rock, Feb. 15, 1897; Duxbury beach, Feb. 15, 1897; Duxbury harbor, Feb. 15, 1897; the approaches to the Cape Cod Ship Channel, Feb. 16, 1897.

Very respectfully,

S. M. Mansfield,

Lieut.-Col., Corps of Engineers.

Statement of Maj. D. W. Lockwood, Corps of Engineers, U. S. A.

Abstract of work of river and harbor improvements in the State of Massachusetts by the United States government, under the direction of Maj. D. W. Lockwood, Corps of Engineers, U. S. A., for the fiscal year ending June 30, 1897.

Taunton River.

The work of dredging under the contract with the Hartford Dredging Company of Hartford, Conn., was completed. There

were 3,355 cubic yards of sand, clay and bowlders removed from near the mouth of Three Mile River, and the channel through the "Needles." With the exception of a small amount of dredging, the channel is now completed from Weir to the lower end of the "Needles."

Hyannis Harbor.

Work under the contract with the Hartford Dredging Company in force at the beginning of the fiscal year was completed during the month of August. There were 14,781 cubic yards of sand and mud removed, adding about 1.2 acres to the 15.5 foot anchorage protected by the breakwater.

A new contract was also made with the same company for continuing the dredging under the appropriation of 1896.

Nantucket Harbor.

A contract for about $19,000 worth of work was entered into with Messrs. S. & E. S. Belden of Hartford, Conn., for continuing the construction of the jetties at the entrance to the harbor. Work under this contract was in progress at the close of the fiscal year, at which time the outer end of the east jetty had been strengthened and additional stone had been placed around the staff supporting the lantern at the end of the jetty, and 1,650 tons had been deposited in an extension of the west jetty.

In December, 1896, during an unusally severe storm, a breach was made through the "Haulover" beach, separating the ocean from the head of the harbor. The breach still remains open. No damage to the jetty channel appears to have resulted from this breach.

Edgartown Harbor.

Work under the contract with the Hartford Dredging Company, in force at the close of the last fiscal year, was commenced and completed during the month of July, 1896. There were 6,485 cubic yards of sand dredged from the Middle Ground Shoal, all of which has been removed to a depth of 10 feet at mean low tide, excepting a very small portion (about one-tenth of the area) on its eastern side.

Vineyard Haven Harbor.

A contract for about $12,000 worth of work was entered into with Mr. William S. White of Rockland, Me., for construction of riprap sea wall and jetties along the low-water line in front of the bluff on the east side of the West Chop and for extending the sea wall on the East Chop about 100 feet to the westward.

Up to the close of the fiscal year 388 tons of stone had been placed in the work on the West Chop, completing about 270 feet of wall.

Woods Hole Harbor.

A contract was entered into with Mr. Charles W. Johnston of Philadelphia for dredging and removing bowlders from the strait leading from Woods Hole Harbor to Buzzards Bay, in pursuance of the project for the enlargement of the channel to a width of 300 feet and depth of 13 feet at mean low water.

At the request of the steamboat company carrying large numbers of passengers through this narrow channel during the summer months, operations under the contract were postponed until the close of the excursion season.

New Bedford Harbor.

The contract for dredging in the 18-foot channel in progress at the close of the last fiscal year was completed in July, 1896, completing the channel to a width of 200 feet.

A contract for about $8,500 worth of dredging was entered into with the Hartford Dredging Company, for the commencement of an anchorage area 18 feet deep adjoining and to the northward of that reach of the main channel extending from New Bedford to Fairhaven. There were 68,887 cubic yards of mud and gravel removed, extending the deep water at the eastern end of the reach for a length of about 1,200 feet parallel to the channel and a width of 600 feet.

Canapitsit Channel.

Work under the contract for dredging in force at the close of the last fiscal year was commenced on the last day of the year.

Wrecks.

During the fiscal year the following wrecks were removed so as to no longer form an obstruction to navigation : —

Schooner "Enterprise," sunk in Vineyard Sound, one mile east south east of Buoy 11 A, eastern end of Norton Shoal.

An unknown wreck, about 5.5 miles south-east from Bishop and Clerk's Light.

Surveys.

The following surveys were made and reports thereon submitted to the Chief of Engineers and the Secretary of War : —

"Channel in New Bedford harbor, Mass., leading to the bridge between that city and Fairhaven, with a view to determining what

amount of dredging would be necessary to make the change in the draw in said bridge from the west to the east side of Fish Island practicable and advantageous." A channel 250 feet wide and 18 feet deep at mean low water is recommended, at an estimated cost of $34,000.

"Mount Hope Bay and Fall River harbor, Mass." A channel 300 feet wide and 25 feet deep at mean low water, leading from the ocean to the wharves at Fall River, is recommended, at an estimated cost of $175,411.94.

Inspections made by the Board during the Year.

1896.

Dec. 19. Dumping of snow and ice from West Boston bridge into Charles River.

1897.

Jan. 29. Wharf of Standard Oil Company of New York on Chelsea Creek, in East Boston.

Feb. 11. J. N. Cowin & Co.'s wharf on Mystic River, at mouth of Gravelly Brook, in Medford.

18. Beach at Point Allerton, in Hull, relative to removal of gravel.

24. Site of proposed wharf of John Stuart, at mouth of Sachem Brook, in Quincy.

26. Drain of Messrs. Swan & Woodberry, on beach in Beverly.

March 4. Fort Point Channel, in front of site of Southern Union Station, relative to the complaint that the material being dumped into the channel at that point was causing an obstruction to navigation.

19. Revere Beach, relative to the removal of sand for use in the work of the Metropolitan Park Commission.

23. Steamship "Armenia," at New England docks, damaged by grounding on ledges in the main ship channel, while passing Bug Light in Boston harbor on March 22, 1897.

26. Beach at North Scituate, relative to removal of gravel.

31. Site of proposed bulkhead of W. A. Swain, on Nahant beach.

April 5. Site of proposed dumping ground for material dredged under contract with the United States government, in Town River, Weymouth.

5. Beach in Hull, relative to removal of gravel.

13. Docks in Plymouth harbor, proposed to be filled under licenses from the Board.

April 22. New Bedford harbor, relative to obtaining material for use in filling solid a portion of the bridge between New Bedford and Fairhaven, authorized by chapter 368 of the Acts of 1883 and chapters 239 and 530 of the Acts of 1894.

May 6. Broad Canal, in Cambridge, on complaint concerning filling.

10. Devereux beach, in Marblehead, relative to the removal of gravel.

12. Dumping ground in Fall River harbor, relative to petition for authority to dump dredged material.

17. Site of proposed boat house of E. N. Cummings, in Lake Whalom.

19. Beach in Hull, relative to the removal of gravel.

20. Bridge of the Plum Island Turnpike Corporation, on Plum Island River, in Newbury.

21. Beach at North Scituate, relative to the removal of stone and gravel.

27. Beach at North Scituate, relative to alleged removal of material without authority from the Board.

28. Beach at Hough's Neck, in Quincy, relative to the removal of material.

June 2. Essex bridge, between Salem and Beverly.

3. Site of structures in Billington Sea, in Plymouth.

4. Site of proposed bridges across Monument River and Back River, in Bourne.

5. } Work done by the Commonwealth on the Province
6. } Lands, in Provincetown.

7. Location of boundary line between Wareham and Marion, as established by chapter 302 of the Acts of 1897.

11. Site of proposed dredging in Weymouth Fore River.

12–16. Boundary line between Gay Head and Chilmark, as established by chapter 323 of the Acts of 1897.

15. Stony Beach, in Hull, relative to the removal of gravel.

17. Bridge between New Bedford and Fairhaven, authorized by chapter 368 of the Acts of 1883 and chapters 239 and 530 of the Acts of 1894, and other work in New Bedford harbor.

18. Wreck in Vineyard Haven harbor.

18. } Site of proposed jetties at Menamsha Inlet, in Gay
19. } Head and Chilmark.

June 24, 25. Jetties and methods used for maintaining and deepening outlets of Salt Pond and Herring River, in Harwich.

26. Site of dredging in Charles River, near Boylston Street, in Cambridge.

28. Location of wreck of schooner "Island Home," in Merrimac River, Newburyport.

July 1. Location of dredging in Charles River.

2. Site of proposed wharf of Cassius Hunt, in South Duxbury.

8–10. Osterville, Cotuit and Hyannis harbors.

9. Beaches at Nantasket, relative to the removal of gravel.

20. Wharf of Geo. H. Wood Company, on Mystic River, in Charlestown.

21. Filling being done at Albin M. Richard's wharf, on Mystic River, in Charlestown.

21. Site of proposed dumping ground for material dredged in Essex River, under contract with the United States government.

21–22, Aug. 5–7, 13–17. Work at Osterville and Cotuit harbors, required by chapter 483 of the Acts of 1897.

4. Charles River, near West Boston bridge; charge for gravel.

12. "Haulover" Beach, at Wauwinet, Nantucket.

19–21. Connecticut River, between Springfield and Holyoke, under chapter 82 of the Resolves of 1897; also protective works on said river, in Agawam.

23. Work at the Southern Union Station, relative to a complaint that timber is being turned adrift and is dangerous to steamers in the harbor.

24. Wharf in Winthrop harbor, now or formerly belonging to Linus M. Child, relative to a complaint that filling was being done without authority from the Board.

26. Dock adjoining the park of the city of Boston on the south channel of Mystic River, near Chelsea bridge, relative to dumping material in said dock.

Sept. 1–3. Work at Osterville and Cotuit harbors, required by chapter 483 of the Acts of 1897.

11. Site of proposed wharf of Willard T. Sears, on Oyster Pond River, in Chatham.

Sept. 13-18. Work at Osterville and Cotuit harbors, required by chapter 483 of the acts of 1897.
25. Beach in Hull, relative to the removal of gravel.
27. Canal at East Cambridge, near wharf of Geo. H. Davenport, on complaint that shoaling has been caused.
29. Site of the wreck of the steamship "Venetian," in Boston harbor.
Oct. 8. Property of the heirs of B. K. Hough, in Gloucester, relative to proposed tide gate.
8. Connecticut River, between Springfield and Hartford, under chapter 82 of the Resolves of 1897.
11. Sites of proposed structures in Lake Chaubunagungamaug, in Webster.
13. Mystic Wharf and Storage Company's wharf on Mystic River, in Charlestown.
15. Cooper's Pond, in Carver.
19. Operation of the Babcock-Lary dredge in New Bedford harbor.
22. Green Harbor, in Marshfield, with State Board of Health.
23. Work done by the Commonwealth on the Province Lands, in Provincetown.
25. Site of proposed marine railway of Read Brothers, on Taunton River, in Fall River.
26. Stony Beach, in Hull, relative to alleged removal of material.
27. Dumping ground for dredged material in New Bedford harbor.
28–30. The method and location of dumping dredged material in New Bedford harbor.
30. Protective works on the Connecticut River, at Agawam.
Nov. 4. Bridge of the Boston, Revere Beach & Lynn Railroad Company, and adjoining flats, in Crystal Cove, Winthrop.
13. Beverly Shore, from Plum Cove to West Manchester.
16. Site of proposed wharf of Smith & Mitchell, in Hull Bay.
18. Canal at East Cambridge, near wharf of Geo. H. Davenport, relative to alleged shoaling.
29. Location of proposed canal and other work at Patch's beach, in Beverly.

Licenses granted during the Year.

Nos.

1977. Petition of the West End Street Railway Company for license to dump snow and ice into tide waters. Granted Dec. 1, 1896.

1978. Petition of the Union Freight Railroad Company for license to dump snow and ice into Charles River and Fort Point Channel. Granted Dec. 1, 1896.

1979. Petition of the New Bedford Yacht Club for license to widen its wharf, on piles, in New Bedford harbor in the city of New Bedford. Granted Dec. 7, 1896.

1980. Petition of Isaac P. T. Edmands and others for license to fill solid and build a culvert in Island End River in the city of Everett. Granted Dec. 8, 1896.

1981. Petition of the Metropolitan Water Board for approval of plans for laying water pipes in Malden River, in the city of Malden, as authorized by chapter 488 of the Acts of 1895. Granted Dec. 21, 1896.

1982. Petition of the city of Boston for license to dump snow and ice into tide waters. Granted Dec. 21, 1896.

1983. Petition of the Tudor Company for license to extend Tudor wharf, on piles, on Charles River in the city of Boston. Granted Dec. 21, 1896.

1984. Petition of J. Theodore Heard and Larkin T. Trull, trustees, for license to build a sea wall and fill solid in Charles River in the city of Boston. Granted Jan. 27, 1897.

1985. Petition of George A. Minott and Mary A. Scammon, trustees, for license to build a sea wall and fill solid in Charles River in the city of Boston. Granted Jan. 27, 1897.

1986. Petition of the Tudor Company for license to extend Tudor Wharf, on piles, on Charles River in the city of Boston. Granted Jan. 27, 1897.

1987. Petition of Alice S. Weeks for license to build and maintain a stone and timber wharf in Marion harbor in the town of Marion. Granted Jan. 27, 1897.

1988. Petition of the Lynn & Boston Railroad Company for license to dump snow and ice into Mystic River. Granted Jan. 27, 1897.

1989. Petition of Helen Hamlin for license to build a stone wharf in Marion harbor in the town of Marion. Granted Feb. 16, 1897.

Nos.

1990. Petition of J. A. Laforme, Winslow Warren and A. C. Reggio, trustees, for license to build a pile wharf on Fort Point Channel in the city of Boston. Granted Feb. 16, 1897.

1991. Petition of the Standard Oil Company of New York for license to build a bulkhead and fill solid in Chelsea Creek at East Boston. Granted Feb. 16, 1897.

1992. Petition of Amos S. Brown, S. Arthur Bubier and Barton E. Kingman, executors of the will of Mary G. Lamper, and Amos S. Brown, trustee, for license to fill a portion of Lamper's Mill Pond in the city of Lynn. Granted Feb. 24, 1897.

1993. Petition of the trustees of the estate of John F. Randall for license to maintain a pile wharf in Boston harbor at East Boston, and to extend and widen said wharf on piles. Granted Feb. 26, 1897.

1994. Petition of the Braintree & Weymouth Street Railway Company for license to lay and maintain suction, drain and discharge pipes in Weymouth Fore River in the town of Braintree. Granted March 5, 1897.

1995. Petition of Elisha H. Tillson for license to construct and maintain a drain in Provincetown harbor in the town of Provincetown. Granted March 5, 1897.

1996. Petition of Jerome C. Borden for license to build a sea wall and fill solid in Mount Hope Bay in the city of Fall River. Granted March 5, 1897.

1997. Petition of John Stuart for license to build and maintain a pile wharf and float stages in Quincy Bay in the city of Quincy. Granted March 5, 1897.

1998. Petition of the trustees of the Bay View Improvement Association for license to build a solid filled wharf in Buzzards Bay in the town of Dartmouth. Granted March 11, 1897.

1999. Petition of Nancy E. Bliss for license to build and maintain a pile wharf and float stage in Pocasset harbor in the town of Bourne. Granted March 23, 1897.

2000. Petition of the city of Cambridge for license to fill solid and change the shore line of Charles River from Boylston Street bridge to the Cambridge Hospital grounds in said city. Granted April 12, 1897.

2001. Petition of William A. Swain for license to build a bulkhead and pile structure in Lynn harbor in the town of Nahant. Granted April 12, 1897.

Nos.

2002. Petition of Joel F. Sheppard for license to build and maintain sea walls and fill solid in Weymouth Fore River in the town of Braintree. Granted April 13, 1897.

2003. Petition of the Braintree & Weymouth Street Railway Company for license to build and maintain a sea wall and fill solid in Weymouth Fore River in the town of Braintree. Granted April 13, 1897.

2004. Petition of William Minot, trustee, for license to fill solid, build a pile wharf, and to dredge, in Chelsea Creek at East Boston. Granted April 15, 1897.

2005. Petition of Orlando E. Lewis for license to fill solid and maintain filling already done in Crystal Cove in the town of Winthrop. Granted April 15, 1897.

2006. Petition of the heirs of J. R. Atwood Estate for license to build a bulkhead and fill solid a portion of a dock in Plymouth harbor in the town of Plymouth. Granted May 5, 1897.

2007. Petition of James Millar & Co. for license to build a bulkhead and fill solid a portion of a dock in Plymouth harbor in the town of Plymouth. Granted May 5, 1897.

2008. Petition of J. E. Lewis & Co. for license to extend a wharf belonging to the United States on Chelsea Creek in the city of Chelsea. Granted May 5, 1897.

2009. Petition of the Walworth Manufacturing Company for license to widen its wharf in Boston harbor near the Reserved Channel at South Boston. Granted May 5, 1897.

2010. Petition of the Worcester & Marlborough Street Railway Company for license to build retaining walls and fill solid in Lake Quinsigamond in the city of Worcester. Granted May 5, 1897.

2011. Petition of the Boston Fire Brick and Clay Retort Manufacturing Company for license to widen a portion of its wharf, on piles, and fill solid, in Boston harbor near the Reserved Channel at South Boston. Granted May 26, 1897.

2012. Petition of Fred McQuesten for license to fill solid and build two pile piers in Boston harbor at East Boston. Granted June 3, 1897.

2013. Petition of the town of Bourne for approval of plans of bridges across Monument River and Back River in said town, as authorized by chapter 139 of the Acts of 1896. Granted June 9, 1897.

Nos.

2014. Petition of the Squantum Yacht Club for license to locate and maintain two float stages in Quincy Bay in the city of Quincy. Granted June 9, 1897.

2015. Petition of Mary L. Hellier for license to build and maintain a wharf and float stage in Marion harbor in the town of Marion. Granted June 9, 1897.

2016. Petition of the Young Men's Christian Association for license to build and maintain a boat and bath house in Lake Whalom in the town of Lunenburg. Granted June 9, 1897.

2017. Petition of Ernest N. Cummings for license to build and maintain a boat house in Lake Whalom in the town of Leominster. Granted June 9, 1897.

2018. Petition of Jackson R. Williams for license to build a pile wharf in Provincetown harbor in the town of Provincetown. Granted June 16, 1897.

2019. Petition of the Plum Island Electric Street Railway Company for license to rebuild the bridges of the Plum Island Turnpike Corporation on Plum Island River and adjoining creeks in the town of Newbury. Granted June 16, 1897.

2020. Petition of Joseph H. Burgess for license to build and maintain a pile wharf in Buzzards Bay in the town of Falmouth. Granted June 16, 1897.

2021. Petition of the Marblehead Supply Company for license to build and maintain a dolphin in Marblehead harbor in the town of Marblehead. Granted June 16, 1897.

2022. Petition of the city of Boston for license to rebuild a portion of the draw pier of Broadway bridge on Fort Point Channel in the city of Boston. Granted June 16, 1897.

2023. Petition of the Board of County Commissioners of Bristol County for approval of plans for the portion of the bridge on Acushnet River between the city of New Bedford and town of Fairhaven lying between Fish Island and Pope's Island, with a draw therein, as authorized by chapter 368 of the Acts of 1893 and chapters 239 and 530 of the Acts of 1894. Granted June 24, 1897.

2024. Petition of the West End Street Railway Company for license to build a bulkhead and fill solid in Dorchester Bay in the city of Boston. Granted June 24, 1897.

2025. Petition of the Walworth Manufacturing Company for license to build a sea wall and fill solid in Boston harbor near the Reserved Channel at South Boston. Granted June 24, 1897.

Nos.

2026. Petition of the Walworth Manufacturing Company for license to extend its wharf, on piles, in Boston harbor near the Reserved Channel at South Boston. Granted June 24, 1897.

2027. Petition of the Revere Yacht Club for license to build and maintain a pier and float stage in Massachusetts Bay in the town of Revere. Granted June 30, 1897.

2028. Petition of the trustees of the estate of John F. Randall for license to build two pile piers in extension of their wharf in Boston harbor at East Boston. Granted June 30, 1897.

2029. Petition of the trustees of the estate of Thomas B. Wales for license to build a sea wall and fill solid a portion of a dock at Harris wharf in Boston harbor in the city of Boston. Granted July 8, 1897.

2030. Petition of the trustees of the Municipal Real Estate Trust for license to build a sea wall and fill solid a portion of a dock at Harris wharf in Boston harbor in the city of Boston. Granted July 8, 1897.

2031. Petition of Cassius Hunt for license to build and maintain a pile pier and float stage in Duxbury Bay in the town of Duxbury. Granted July 8, 1897.

2032. Petition of the town of Fairhaven for approval of plans of a bridge and solid filling in the extension of Middle Street, on Acushnet River in said town, as authorized by chapter 503 of the Acts of 1896. Granted July 8, 1897.

2033. Petition of Loring W. Puffer for license to build and maintain a pile pier and float stage in Buzzards Bay at Onset Island in the town of Wareham. Granted July 8, 1897.

2034. Petition of the city of New Bedford for approval of plans of a dam between Great Quittacus Pond and Pocksha Pond, with an overflow and wasteway, in the towns of Middleborough and Lakeville, as authorized by chapter 345 of the Acts of 1894. Granted July 14, 1897.

2035. Petition of the Boston & Maine Railroad for license to fill flats, build a pile platform, and dredge, in Mystic River in the city of Somerville. Granted July 14, 1897.

2036. Petition of the Union Street Railway Company for license to build a temporary pile bridge between Pope's Island and Fish Island on Acushnet River in the city of New Bedford. Granted July 14, 1897.

Nos.

2037. Petition of the town of Cohasset for license to build a dam and tide gates in Gulf River in said town. Granted July 14, 1897.

2038. Petition of the Metropolitan Water Board for approval of plans of a bridge across Mystic River in the city of Medford, for the support of water pipes, as authorized by chapter 488 of the Acts of 1895. Granted July 20, 1897.

2039. Petition of the city of Worcester for license to build a stone bridge at the causeway crossing Lake Quinsigamond in said city. Granted July 20, 1897.

2040. Petition of the Boston Terminal Company for approval of plans for filling docks and wharves on Fort Point Channel in the city of Boston, as authorized by chapter 516 of the Acts of 1896. Granted Sept. 2, 1897.

2041. Petition of the city of Boston for approval of plans of a sea wall and solid filling in Fort Point Channel in said city, as authorized by chapter 516 of the Acts of 1896. Granted Sept. 3, 1897.

2042. Petition of the Roxbury Central Wharf for license to construct docks and wharves, fill lands and flats, and dredge, in South Bay in the city of Boston. Granted Sept. 3, 1897.

2043. Petition of the city of Boston for license to build a bridge and sea wall, and fill solid, on Fort Point Channel in said city. Granted Sept. 7, 1897.

2044. Petition of Charles M. Partelow for license to build and maintain a marine railway in Boston harbor at Point Shirley in the town of Winthrop. Granted Sept. 7, 1897.

2045. Petition of the estate of George S. Harwood for license to rebuild a pile structure in Charles River adjoining Galen Street in the town of Watertown. Granted Sept. 7, 1897.

2046. Petition of the People's Telephone Company for license to lay and maintain cables in Merrimac River in the city of Haverhill and town of Groveland. Granted Sept. 7, 1897.

2047. Petition of the city of Boston for license to repair the middle and south piers of the North Ferry in Boston harbor at East Boston. Granted Sept. 7, 1897.

2048. Petition of John Pridgeon, Jr., for license to build and maintain a pile pier in Vineyard Haven harbor in the town of Cottage City. Granted Sept. 8, 1897.

2049. Petition of the Cambridge Gas Light Company for license to fill solid and maintain filling already done in Broad Canal in the city of Cambridge. Granted Sept. 8, 1897.

Nos.

2050. Petition of Frederick Ayer for license to build a bulkhead and pile platform and fill solid in Broad Canal in the city of Cambridge. Granted Sept. 9, 1897.

2051. Petition of Frank L. Young for license to build a bulkhead and fill flats in Boston harbor at South Boston. Granted Sept. 15, 1897.

2052. Petition of Willard T. Sears for license to build and maintain a pile pier on Oyster Pond River in the town of Chatham. Granted Sept. 15, 1897.

2053. Petition of the West End Street Railway Company for license to widen its wharf, on piles, in South Bay in the city of Boston. Granted Sept. 15, 1897.

2054. Petition of J. Theodore Heard and Larkin T. Trull, trustees, for license to widen and extend their wharf, known as Winslow's wharf, on Charles River in the city of Boston. Granted Sept. 17, 1897.

2055. Petition of the heirs of Andrew G. Bradford for license to build and maintain a boat landing in Billington Sea in the town of Plymouth. Granted Sept. 17, 1897.

2056. Petition of William E. Baker for license to build and maintain a boat landing in Billington Sea in the town of Plymouth. Granted Sept. 17, 1897.

2057. Petition of the West End Street Railway Company for license to lay pipes in Charles River near its Harvard power station in the city of Cambridge. Granted Sept. 17, 1897.

2058. Petition of Benjamin Johnson for license to build a sea wall and pile platform and fill solid in Town River in the city of Quincy. Granted Sept. 17, 1897.

2061. Petition of the Fiske Wharf and Warehouse Company for license to widen Harris wharf, on piles, in Boston harbor in the city of Boston. Granted Sept. 24, 1897.

2062. Petition of the city of Cambridge for license to fill solid and change the north-easterly shore line of Charles River between Boylston Street and Western Avenue in said city. Granted Sept. 29, 1897.

2063. Petition of Steward & McDermott for license to build a temporary pile bridge between Fish Island and Pope's Island on Acushnet River in the city of New Bedford. Granted Sept. 29, 1897.

2064. Petition of C. A. Sawyer for license to build and maintain a pile and timber wharf and boat house in Lake Whalom in the town of Leominster. Granted Sept. 29, 1897.

Nos.

2065. Petition of Augustus S. Messer for license to build a wharf, partly solid and partly on piles, in Woods Hole Great Harbor in the town of Falmouth. Granted Sept. 29, 1897.

2066. Petition of Augustus S. Messer for license to build a sea wall and fill solid in Woods Hole Little Harbor in the town of Falmouth. Granted Sept. 29, 1897.

2067. Petition of the Board of Metropolitan Park Commissioners for approval of plans for filling solid in Lower Mystic Lake in the city of Medford, as authorized by chapter 288 of the Acts of 1894. Granted Oct. 7, 1897.

2068. Petition of H. Porter Hall and C. E. Dresser for license to build and maintain a stone and timber wharf in Lake Whalom in the town of Lunenburg. Granted Oct. 7, 1897.

2069. Petition of Eugene V. R. Thayer for license to build and maintain a sewer in tide water in the city of Beverly. Granted Oct. 19, 1897.

2070. Petition of the city of Quincy for license to lay and maintain a water pipe in Town River in said city. Granted Oct. 19, 1897.

2071. Petition of Edgar S. Hill for license to build and maintain a stone wharf in Lake Chaubunagungamaug at Eliott Shore in the town of Webster. Granted Oct. 19, 1897.

2072. Petition of Edgar S. Hill and Arthur G. Pattison for license to build and maintain a stone and timber wharf in Lake Chaubunagungamaug at Point Breeze in the town of Webster. Granted Oct. 19, 1897.

2073. Petition of the Manomet Cranberry Company for license to build and maintain jetties in Fresh Pond in the town of Plymouth. Granted Nov. 2, 1897.

2074. Petition of F. T. Akin & Co. for license to extend their wharf on Acushnet River in the city of New Bedford. Granted Nov. 2, 1897.

2075. Petition of the Walworth Manufacturing Company for license to construct and maintain a dolphin in Boston harbor near the Reserved Channel at South Boston. Granted Nov. 2, 1897.

2076. Petition of the Mystic Wharf and Storage Company for license to extend and widen its wharf, on piles, on Mystic River in the city of Boston. Granted Nov. 4, 1897.

2077. Petition of Read Brothers for license to fill solid and build a marine railway in Taunton River in the city of Fall River. Granted Nov. 10, 1897.

Nos.

2078. Petition of the Fitchburg Railroad Company for license to extend its pier known as Piers 6 and 7, at the Hoosac Tunnel Docks on Charles River in the city of Boston, to the harbor line established by chapter 479 of the Acts of 1897. Granted Nov. 16, 1897.

2079. Petition of the city of Fall River for license to construct coffer-dams and a flume in North and South Watuppa lakes in the city of Fall River and town of Westport. Granted Nov. 23, 1897.

2080. Petition of Horace S. Crowell for license to build and maintain pile structures and a float stage in Woods Hole Great Harbor in the town of Falmouth. Granted Nov. 23, 1897.

2081. Petition of the West End Street Railway Company for license to dump snow and ice into tide waters. Granted Nov. 23, 1897.

2082. Petition of the Union Freight Railroad Company for license to dump snow and ice into Charles River in the city of Boston. Granted Nov. 23, 1897.

Miscellaneous Permits granted during the Year.

Eastern Dredging Company, to dump material dredged in Merrimac River, under contract with the United States, on flats in said river above Rocks bridge. Granted Dec. 7, 1896.

P. O. Riorden, to use a portion of the South Boston flats for storing sand, gravel and other material. Granted Dec. 7, 1896.

Boston & Maine Railroad, to publish notice, in the name of the Board, of the closing of Squam River in Gloucester to the passage of vessels through the draw in the Eastern Division bridge of said railroad for the purpose of constructing a new tower and foundation. Granted Dec. 15, 1896.

Samuel A. White, to remove gravel from Ocean Beach near Waveland station, in Hull. Granted Dec. 21, 1896.

William H. Sylvester, to remove gravel from the beach at Point Allerton, in Hull. Granted Feb. 24, 1897.

Frank C. Hyde, to remove gravel from Ocean Beach, in Hull. Granted Feb. 24, 1897.

Emma A. Abbott, to remove stones from the beach at Point Allerton, in Hull. Granted Feb. 24, 1897.

E. Willard Frost, to remove gravel from Ocean Beach, in Hull. Granted Feb. 24, 1897.

Central Wharf and Wet Dock Corporation, to dump snow and ice into tide waters. Granted Feb. 26, 1897.

Joseph L. Boardman, to remove gravel from Salter's beach, in Plymouth. Granted March 5, 1897.

Bay State Dredging Company, to dump material dredged in the channel leading to the wharf of the Boston and Nantasket Steamboat Company on flats between White Head and Strawberry Hill, in Hull. Granted March 5, 1897.

Eastern Dredging Company, to dump material dredged in Malden River, under contract with the United States, on land and flats in a creek adjoining said river. Granted March 8, 1897.

Hartford Dredging Company, to dump material dredged in New Bedford harbor, under contract with the United States, in said harbor north of a line drawn due east from Egg Island and east of a line drawn due north from said island. Granted March 12, 1897.

Edward J. Cashman, to dredge material from the "middle ground," at Lobster rocks in Lynn harbor. Granted March 25, 1897.

John W. Earl, to dredge material from the "middle ground," at Lobster rocks in Lynn harbor. Granted March 25, 1897.

William E. Sherriffs, to remove sand and gravel from the beach between the Oregon House and Hotel Pemberton, in Hull. Granted April 6, 1897.

Louis T. Cushing, to remove gravel from Collier beach, in Scituate. Granted April 6, 1897.

Town of Scituate, to remove gravel from Collier beach, in Scituate. Granted April 6, 1897.

Town of Scituate, to excavate at North Scituate beach, for the purpose of widening the road leading to the "Glades" in said town. Granted April 6, 1897.

George C. Corcoran, to use for storage purposes 5,000 square feet of land on the easterly side of C Street, on the South Boston flats. Granted April 6, 1897.

Bay State Dredging Company, to dump material dredged in Weymouth Fore River, under contract with the United States, on flats situate on the northerly side of said river. Granted April 6, 1897.

Maria A. D'Orville, to remove gravel from Ocean beach near Kenberma station, in Hull. Granted April 13, 1897.

John J. O'Brien & Co., to remove sand from the Revere beach reservation, between mean high and low water marks, under contract with the Metropolitan Park Commissioners, for use in the approaches to the abutments at Revere Street. Granted April 15, 1897.

JOHN J. O'BRIEN & Co., to remove sand from the Revere beach reservation, between mean high and low water marks, under contract with the Metropolitan Park Commissioners, for use in the approaches to the abutments built in connection with the relocation of the Boston, Revere Beach and Lynn Railroad. Granted April 15, 1897.

WILLIAM T. EATON, to remove sand from the Revere beach reservation, under contract with the Metropolitan Park Commissioners, for use in connection with the erection of the bathing establishment, shelters and subways on said reservation. Granted April 15, 1897.

JAMES C. CHURCH, to remove gravel from Ocean beach near Kenberma station, in Hull. Granted April 15, 1897.

BOSTON TERMINAL COMPANY, to build a temporary pile trestle on Fort Point Channel in the city of Boston, for the purpose of carrying out the work authorized by chapter 516 of the Acts of 1896. Granted April 26, 1897.

CITY OF CAMBRIDGE, to dredge flats adjoining the outlet of the Bridge Street sewer on Charles River, and to dump the dredged material east of a line drawn from Egg Rock to Minot's Light. Granted April 29, 1897.

OLIVER S. SANFORD and O. S. SANDERS, to dredge material from their flats in Dorchester Bay. Granted April 29, 1897.

NANTASKET CHUTE COMPANY, to lay a water pipe in tide water at Nantasket Beach, in Hull. Granted April 29, 1897.

WILLIAM P. CLYDE & Co., to dredge in Shirley Gut, Boston harbor, between Point Shirley and Deer Island. Granted May 5, 1897.

JOHN W. EARL, to dredge material from the "hump sands" near the mouth of the Merrimac River. Granted May 5, 1897.

PETER MCCONARTY, to use for storage purposes a portion of the Commonwealth's land on the South Boston flats. Granted May 5, 1897.

WILLIAM J. GOLDTHWAIT, to remove sand and gravel from Devereux beach, in Marblehead. Granted May 11, 1897.

JOHN T. KALER, to remove gravel from the beach in Hull Bay, opposite his land on Spring Street, in Hull. Granted May 20, 1897.

CHARLES S. GOODING, to remove gravel from Ocean Beach near Kenberma station, in Hull. Granted May 20, 1897.

STEWARD & MCDERMOTT, to dredge material in Acushnet River for use in filling a portion of the highway bridge under construction between New Bedford and Fairhaven. Granted May 20, 1897.

Joseph A. Bowen, to dump dredged material on flats in Coles River, in Swansea. Granted May 24, 1897.

Bay State Dredging Company, to dredge material from Charles River, between North Harvard Street bridge and a line drawn across said river 4,000 feet up stream from said bridge. Granted May 26, 1897.

John V. Scott, to remove gravel from Manet beach at Hough's Neck, in Quincy. Granted June 2, 1897.

Town of Duxbury, to remove sand and gravel from Duxbury beach opposite Cut Island in said town. Granted June 10, 1897.

John T. Kaler, to remove gravel from the beach lying between Stony beach and Point Allerton, in Hull. Granted June 10, 1897.

Albert L. Jewell, to remove sand and gravel from the beach lying between Atlantic Hill and Hotel Nantasket, in Hull. Granted June 15, 1897.

Emma E. Hobart, to remove gravel from Ocean beach between Kenberma and Bayside stations, in Hull. Granted June 15, 1897.

Town of Scituate, to remove gravel from North Scituate beach. Granted June 23, 1897.

Cunningham Iron Company, to change the location of the railroad track across B Street, in South Boston. Granted June 25, 1897.

Bay State Dredging Company, to dredge material from Charles River between North Harvard Street bridge and a line across said river 1,000 feet down stream from said bridge. Granted June 28, 1897.

William B. Bird, to remove gravel from the beach between Crow Point and Jarvis Avenue, in Hingham. Granted June 29, 1897.

New England Railroad Company, to connect a drain pipe from its freight house on B Street with the Commonwealth's sewer in Fargo Street, on the South Boston flats. Granted July 1, 1897.

Eastern Dredging Company, to dredge material from Charles River, between a line drawn across said river at a point 400 feet above North Harvard Street bridge and a line across said river 2,000 feet up stream from said bridge. Granted July 6, 1897.

City of Boston, to lay water pipes in B Street from Danby Street to Congress Street; in E Street from Danby to Congress Street; and in Danby Street between B and E streets, on the South Boston flats. Granted July 12, 1897.

George G. Crocker and others, trustees, and Mary G. Fisk, to dredge material from their flats on the Cambridge side of the channel in Charles River, near West Boston bridge. Granted July 20, 1897.

Perkins & White, to dump material dredged in Town River, under contract with the United States, on land and flats of William A. Gavin, in the city of Quincy. Granted July 20, 1897.

Eastern Dredging Company, to dredge material from Charles River, between a line drawn across said river from the southwesterly corner of Wellington's wharf and a line drawn across said river from the intersection of the southerly line of Stiles Street and the high-water line. Granted July 30, 1897.

Perkins & White, to dump material dredged in Town River, under contract with the United States, on land and flats of Benjamin Johnson, in the city of Quincy. Granted Aug. 5, 1897.

George C. Corcoran, to use for storage purposes a portion of the Commonwealth's land on the easterly side of C Street on the South Boston flats. Granted Sept. 3, 1897.

New England Telephone and Telegraph Company, to place and maintain eight poles for the support of wires on land of the Commonwealth north of Congress Street on the South Boston flats. Granted Sept. 7, 1897.

Columbia Dredging Company, to dump dredged material in New Bedford harbor, north of a line drawn due east from Egg Island and east of a line drawn due north from said island. Granted Sept. 8, 1897.

Kate A. Knowlton, to remove stones from the beach bordering on Nantasket Roads, in Hull. Granted Sept. 27, 1897.

Emma A. Abbott, to remove stones and gravel from the beach at Point Allerton, in Hull. Granted Oct. 7, 1897.

Eastern Dredging Company, to dump material dredged in Essex River, under contract with the United States, on certain flats in said river. Granted Oct. 12, 1897.

Estate of Timothy A. Newhall, to dredge from their flats in Lynn harbor. Granted Oct. 13, 1897.

Bay State Dredging Company, to dump material dredged in Mystic River, under contract with the United States, in certain creeks adjoining said river. Granted Oct. 28, 1897.

Bay State Dredging Company, to dump material dredged in Mystic River, under contract with the United States, on certain flats in said river. Granted Nov. 2, 1897.

Oliver S. Sanford and O. S. Sanders, to dredge material from their flats in Dorchester Bay. Granted Nov. 5, 1897.

W. H. READ and H. R. READ, to dump material dredged in Taunton River for the construction of a marine railway in Fall River, on flats in Coles River lying north-west of Mattapoisett Rock, in Swansea. Granted Nov. 23, 1897.

HARBOR COMPENSATION FUND.

There was paid into the treasury of the Commonwealth during the year, under sections 14 and 16 of Chapter 19, Public Statutes, and chapter 146, Acts of 1897, in payment for tide water displaced by work done under licenses granted by the Board, and for rights and privileges granted in tide waters and great ponds, the sum of $3,813.40, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1897, was $234,933.61. The income from this fund on the same date was $14,477.13.

SALARIES OF COMMISSIONERS.

The attention of the Legislature is again invited to the inadequate compensation of the Board, in the belief that the increased work and responsibility of the commission will receive due consideration.

The foregoing report is respectfully submitted.

WOODWARD EMERY,
CHARLES H. HOWLAND,
CLINTON WHITE,
Commissioners.

DECEMBER 1, 1897.

APPENDIX.

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APPENDIX.

[A.]

[See page 24 of this report *ante*.]

REPORT OF THE ENGINEER ON OSTERVILLE AND COTUIT HARBORS.

BOSTON, Nov. 13, 1897.

Board of Harbor and Land Commissioners.

GENTLEMEN: — In accordance with your instructions, I have made an examination and survey of Osterville and Cotuit harbors and the strip of land lying between Osterville Bay and Vineyard Sound, between Wianno Beach and the mouth of Sepuit River, and have obtained such information as I could in relation to the construction of a channel between the South Bay, so called, and the Sound.

Chapter 483 of the Acts of 1897, which authorizes this investigation, is based on the petition of Nathan E. West and others to the Legislature, and the object is to open a passageway for small yachts and other boats from the South Bay into the Sound, in order to avoid the long and difficult trip from the North Bay through the Narrows and Cotuit Bay into the Sound, making a saving of two to three miles on a trip.

The Cotuit and Osterville harbors consist of a series of basins located between the villages of Cotuit and Osterville on the south shore of the town of Barnstable, opening into the Sound by what is known as Cotuit entrance. This entrance lies between Codman's Point, which projects easterly from Cotuit highland, and the westerly end of a ridge or sand beach known as Dead Neck Beach, which extends westerly from the main land at Osterville. Between these two points lies Sampson's or Daniels' Island, which divides the entrance into two channels, known as the Main Channel and the Old or Eastern Channel. After passing Sampson's Island the Main Channel divides into two others, known as the Middle nel and the Western or Rushy Marsh Channel. Between lies a small patch of marsh surrounded by a large shoal, and n as Gull Island. Inside of this entrance the first bay is Cotuit Bay, with an area of about 295 acres, forming the

harbor of Cotuit. Lying north-easterly of this is the North Bay, with an area of about 326 acres, the easterly end of which forms the western harbor of the village of Osterville. This is connected with Cotuit Bay by the Narrows, so called, having an area of about 127 acres. Lying south of North Bay and east of Cotuit Bay is the South Bay, with an area of about 334 acres, which it is proposed to make into a new harbor for the village of Osterville by means of a cut through the narrow beach which separates it from the Sound. This South Bay is connected with the North Bay by a short channel, and with Cotuit Bay by the Sepuit River, which has an area of about 44 acres, with a general width of about 300 feet, and separated from the Sound by the narrow sand ridge called Dead Neck Beach. Lying north of and connected with the North Bay is another small bay, known as Prince's Cove or Mill River, which has an area of about 60 acres.

The general depth of water which can be utilized for sailing through these various bays and their connection is from 4 to 6 feet at low water, though at places in the Cotuit and North bays there is a much greater depth. The upper part of Sepuit River and the southerly portion of the South Bay are quite shoal, and at present are not navigable, even for light draft boats, except at or near high water.

In 1876 a petition for authority to construct a similar cut through the beach "between the necks" was made to the Legislature by Orville D. Lovell and 113 others, in which they state that it would greatly advance their business and convenience, and that this strip of beach was gradually washing away, and would within a few years leave such a passage by the natural action of the waves.

Thomas Chatfield and 43 others, largely residents of the village of Cotuit, presented a petition remonstrating against the petition of Mr. Lovell, stating that in their opinion the cutting of such a channel would prove an injury to the harbor of Cotuit; that it would lessen the current on the ebb tide, by which the Cotuit channel was kept open over the bar; and that it would make an island of Dead Neck, so called, and destroy the means of getting teams onto Grand Island, so called, which had lately been purchased by New York parties, who intended to erect buildings for summer residences there. The petition also stated that between twenty-five and thirty vessels winter at Cotuit annually, and required all the water then on the bar at average tides to pass in and out.

These petitions were referred to the committee on harbors, and the petitioners, on the recommendation of that committee, were given leave to withdraw.

While the petitions were being considered, the Harbor Commissioners, at the request of the committee on harbors, directed their engineers, Prof. Henry Mitchell and D. Koppmann, to make a general examination of the locality and to report thereon. In their report they state that the storm seas are washing away the headlands along the coast in this vicinity and strewing the sands into and across little fiords, which are characteristic features in the physical geography of this part of the country. Their visit to the locality in March, 1876, was shortly after a violent equinoctial gale. They found that the bluff about 1¼ miles eastward of the site of the proposed cut, according to the statements of the occupant of the house at this point, had fallen back about 7 feet during that gale, the bluff at this point being about 18 feet above sea level. At the time of their visit little or no trace of this material could be distinguished on the beach. From the same parties it was learned that the material was swept to the westward as it fell. The storm began from the north-east, but veered to the south-west before it reached its greatest fury. All along the bluff, toward the site of the proposed cut, they found freshly fallen trees lying on the face of the bluff, and from the appearance of these trees and of others still standing, they judged that the bluff had fallen back at least 6 feet in the recent storm. Not only did they notice none of the material on the beach, but the parties living there stated that the width and elevation of the beach had not been noticeably changed. On the beach where the proposed cut was to be made they could discover no marked effects of the storm, with the exception of traces of trifling runs of water over it; and they state that "this isthmus, as well as we could observe, is a dry bar created by the sea, and probably falling back on the bay as the uplands on either side crumble away." They found that the bluffs to the westward of the proposed cut showed traces of great slides during the recent gale, but these slides generally did not extend to the crest of the bluff. They go on to state that "Dead Neck is slowly advancing to the south-westward, probably with material supplied by the wear of the bluffs, upon which we have commented, the point having gained 12 acres within the memory of one of the two owners, and 20, as estimated by the other. . . . The west shore of Cotuit entrance is mostly upland, presenting here and there bluffs facing the sea. The recent storm has torn the lower bluff of Cotuit Highlands (which is about 25 feet high), precipitating several living trees of considerable size. Stumps of trees are also seen beyond the bluff, betraying the effects of the storms of past years. The islands, also, of Cotuit entrance are being washed away, although the marshes, of which they are in part composed, resist obstinately

the action of the sea." In regard to the Cotuit entrances, they state: "Leaving Cotuit port, the channel is divided into two waterways by Sampson's and Russia Marsh islands; and these two divisions, although they again approach each other slightly, cross the bar separately. They no sooner escape from the confinement of the inlet than they begin to shoal up, from 10 or 12 feet in the Narrows, to 3 or 4 feet before you get 500 feet beyond them."

No surveys were made at this time, the only observations being those which could be taken during a short visit to and inquiries made at the locality, together with such information as could be obtained from the printed coast survey charts.

The information which I have sought to obtain through my surveys and investigations was to determine to what extent the volume and velocity of the tidal flow through the Cotuit entrances would be affected, providing such a cut should be made through the beach from the South Bay, as would create a navigable channel for boats drawing in the neighborhood of three or four feet.

I first obtained from the U. S. Coast Survey Office at Washington copies of all their surveys of this locality up to the present time. They sent me three plans of soundings, one made in 1854, one in 1855 and 1856, and one in 1888, the survey of 1888 being the only one in which the soundings were taken in the bays, but even at this time none were taken in the South Bay. They also sent copies of the plans of their surveys of the topography, one made in 1846, and the other in 1890. This last survey I have used as the basis for the plan which I have made.

In starting the work, I first established tide gauges, one near the entrance of Cotuit Harbor on the wharf of Mr. Morse, just south of Cotuit Highlands; another on the wharf of Mr. Scoville, about a mile east of the proposed cut; and a third at the bridge between the village of Osterville and Grand Island. Four subsidiary gauges were established, one at each end of the Narrows between the North Bay and Cotuit Bay; one at the head of Eel River, near the proposed cut; and the fourth at the south-westerly corner of the South Bay, near the head of Sepuit River. Soundings were taken all over the South Bay, Eel River, Sepuit River, the Narrows, and from Cotuit Bay out through the entrances and to a line beyond the bar. Observations were made of high and low water for more than a month at each of the three main gauges, and simultaneous readings were taken at all of the gauges on two different occasions for a full tide.

A system of triangulation was extended from two stations of the coast survey over the area under examination. Based on this

the shore line of Mill River, Eel River and a portion of the North and South Bay near the Grand Island bridge, and of the South Bay near the head of Sepuit River, was surveyed and mapped to supplement the copies of the coast survey maps, which we obtained from Washington. The velocity of the flood and ebb currents was measured at three stations, — one in the Sound about 1,000 feet south from the shore of Dead Neck; one in the old outlet of Cotuit harbor, between the point of Dead Neck Beach and Sampson's Island; and the other in the present outlet, between Sampson's Island and Codman's Point. From the results of these surveys and observations we find that the mean range of the tide in the Sound at this locality is nearly three feet; the area of the various bays, mean range of the tide and tidal volume of each are given in the following table: —

	Area. Square Feet.	Mean Range of Tide. Feet.	Mean Tidal Volume. Cubic Feet.
Cotuit Bay, ...	12,832,500	2.85	36,572,625
The Narrows, ...	5,525,000	2.7	14,917,500
North Bay, ...	14,225,000	2.6	36,985,000
Mill River, ...	2,581,500	2.0	5,163,000
South Bay, ...	14,570,000	2.14	31,179,800
Sepuit River, ...	1,937,500	2.7	5,231,250

The depth of water at the present time over the bar at Cotuit entrance is about 3½ feet at mean low water, which is substantially the depth testified to at the hearings at Osterville and Cotuit.

An examination of the cross-sections of the beach on either side of Dead Neck shows that from the crest of the ridge down to nearly 3 feet below mean low water the slope of the outside beach is quite regular and rapid, averaging about 15 to 1. Below this the bottom is very flat, the depths of 3 feet below mean low water being found from 200 to 300 feet beyond the high-water mark; 4 feet, from 600 to 800 feet; and 5 feet, from 800 to 1,000 feet beyond the same mark, the water deepening most rapidly opposite the head of Sepuit River.

The bottom of the Sound just outside of the bluff of Dead Neck, and opposite Sampson's and Gull islands, is covered with boulders generally 6 inches to a foot or more in diameter, indicat-

ing that these areas were originally portions of the upland which have been washed away. There appears to be no eel grass growing in these localities, but the bottom is very flat, with the boulders lying practically on the surface.

I have examined the shore of the Sound from the East Bay at Osterville to Popponessett entrance, a distance of about 5 miles. All the bluffs along this distance show the effects of having caved down and been washed away by the sea, and, wherever they are unprotected by artificial structures, are still being worn away. The protected portions extend about 1,500 feet north-east and about 3,000 feet south-west from the wharf near the Cotocheset House, and for a distance of about 2,000 feet in front of the premises of Mr. Morse and others at Cotuit.

The method which has been adopted for protecting the bluffs in this vicinity consists of building a wooden bulkhead at the foot of the bank at about extreme high-water mark, consisting of heavy stakes driven by hammers, with 2-inch plank spiked on the inner faces of the stakes. Extending from these and at right angles thereto are similar bulkheads or jetties which extend down to or below low-water mark, and from 20 to 50 feet apart. The top edges of the plank are left about a foot above the surface of the beach. These jetties tend to break up the waves striking on the beach and prevent them from undermining the bulkhead and from drifting the material along the shore. The tendency of the sand and shingle to drift along the shore is shown wherever these jetties are placed, by the sand being piled up on the side of the jetties from which the sand is coming and being cut away from the opposite side. The bulkhead along the high-water line intercepts the material which has caved down from the bank by the action of the frost and surface water, and prevents it being carried out into the sea, where it would be drifted along the beach. This construction is comparatively light and is often injured by the heavy seas and requires constant repairs, but has proved quite effective in stopping the wear of the bluffs. The bluffs of Dead Neck are still unprotected. Portions of the westerly end of Dead Neck Beach and the easterly ends of Popponessett and East Bay beaches are growing. The accumulations of sand collected by the protective works which have been built show that the sand has apparently been drifting along the shore from west to east, while the growth of the Popponessett and East Bay beaches is an additional indication that the drift of the sand is in the same direction. The growth of the westerly end of Dead Neck Beach would seem to indicate that at some point between Dead Neck bluff and the Cotocheset House the drift of the sand changes, and along Dead Neck Beach and bluffs

the material travels from east to west. In studying the question of the wear of the shore, I have compared the topographical sheets of the coast survey, made in 1846 and 1890. This comparison shows that between the break which was made in the Popponessett Beach about 1886 or 1887, and the present entrance to the East Bay (a distance of about 5 miles) the bluffs and beaches have worn away in some places and advanced in others, so that the areas within the high-water lines of 1890 show a loss of 110 acres and an increase of 58 acres in these forty-four years. The increase is principally at the ends of Popponessett, Dead Neck and East Bay beaches, while the decrease is mainly along the high upland bluffs of glacial drift and at the two islands in the Cotuit entrance. Portions of the Popponessett and East Bay beaches have been driven in toward the main land without material change in their size, while other portions of Popponessett Beach and a portion of the Dead Neck Beach have been materially reduced in width. One of the islands in the Cotuit entrance has been practically all washed away. The whole of the sand ridge which formed the main portion of it has been washed away to below the level of low water, leaving only a small circular area of marsh, about 30 or 40 feet in diameter, whose surface is a little above the level of low water.

As before stated, no soundings were taken by the coast survey previous to 1888 within the Cotuit entrance and bays, and the 1888 surveys were too general to be of much value in comparing with our more detailed survey.

I learned from some of the boatmen and others that within their remembrance there was an area of deep water lying between the end of Popponessett Beach and Gull Island, where vessels could lie at anchor afloat at all stages of the tide. They stated that this had so filled up that it would be dangerous for a vessel to anchor there now. By comparing the survey which I made in July, 1893, in connection with the investigation to locate the boundary line between Mashpee and Barnstable through Popponessett Bay, with our recent surveys, I find that since 1893 the westerly point of the Gull Island shoal has grown out into the Rushy Marsh channel, reducing its width and depth; also that the channel from Popponessett Bay has been forced farther to the north-east, and is now partially within what was in 1893 the channel from Cotuit Bay; also that a shoal has grown out from the main land opposite the north-westerly point of the Gull Island shoal, so that the Rushy Marsh channel is now only 60 to 70 feet wide for a distance of about 300 feet at this place. The sand along the shore between Popponessett Beach and Codman's or Bluff Point appears to be drifting from the

south-west to the north-east, as testified to by Mr. Morse at the hearing at Cotuit, and as shown by the piling up of the sand against the jetties which have been built in front of his premises, and along the shore south-westerly from him. As this sand reaches the end of Codman's or Bluff Point, the ebb current evidently takes a portion of it and pushes it back toward the sea, making the hook-shaped shoal extending from Codman's Point southerly and south-westerly, substantially parallel with the north-westerly side of Sampson's or Daniels' Island, the main entrance to the harbor lying between the island and this shoal. The balance of the material has probably been carried along by the flood tide and spread over the outer or southerly portion of the Cotuit Bay, but I have not been able to find any direct evidence of this. The material from the southerly end of Sampson's Island appears to have been driven round to the north-westerly point of the island, and mainly deposited there in a long shoal which extends westerly and south-westerly therefrom. These two shoals appear to be ridges built out into a deep depression which formerly existed between the main land and Daniels' and Gull islands, and apparently are tending to gradually fill it up, leaving only a small channel through it for the passage of tide water in and out of Cotuit Bay.

The investigations which I have made tend to show that Daniels' Island and Gull Island are the remains of two points of a large island of glacial drift, which covered the territory lying south-east of the existing islands, the basin lying between it and the main land being of considerable depth, and similar to the present Cotuit Bay. By the wearing away of the island, material has been supplied for building the shoals in the vicinity; and now the main land, having lost the protection from the wind and waves which was afforded by the island, is wearing away, the point south-west of Mr. Morse's estate having lost over 8 acres since 1846; and the material so furnished, together with material from the remains of the island, is gradually filling up the basin, and it seems to me that it is only a question of a very few years before the Rushy Marsh channel will be closed at the narrow gut between the north-westerly point of Gull Island shoal and the main land, and the only available entrance to Cotuit will be through what is now known as the Middle channel between Gull Island and Daniels' Island.

In the petition of Orville D. Lovell and others to the Legislature in 1876 for authority to excavate a channel from Eel River into the Sound, they stated that the beach at this point was washing gradually away and would within a few years leave such a passage

by the natural action of the waves. In commenting on this, the engineers of the Board in 1876 state that "this isthmus, as well as we could observe, is a dry bar created by the sea and probably falling back on the bay as the uplands on either side crumble away." By a comparison of the coast survey plans of 1846 and 1890, I find that the inner edge of the ridge or sand bar on both sides of Dead Neck has not moved appreciably, while the high-water line on the outer side has worn away very much, a comparison of the plans showing a loss of about 50 to 60 feet in width opposite Eel River and about 40 feet on the west of Dead Neck. From this evidence it would seem that there is some ground to expect that a cut would be made here at some time by the operations of nature; but at the rate the beach has worn away in the last forty-four years, it will take considerable time yet to accomplish it, and even if such a break should occur, it might close again in the same manner as the break through Popponesset Beach closed within a few years after it occurred, unless some means were taken to protect and maintain it by building jetties or similar structures.

In studying the question of a new entrance for Osterville harbor through the beach into the South Bay, which will not injure the harbor of Cotuit, the following conditions are to be satisfied. The amount of tidal volume passing in and out of the new entrance shall not reduce the volume now passing in and out of Cotuit entrance, and the cut shall be of sufficient size to enable yachts and boats to pass in and out readily. From the results of our tidal observations, we find that the rise and fall of the tide in the South and North bays is not as great as in the Cotuit Bay. If an entrance can be made of such a size as to allow an amount of tide water to enter and leave the South Bay through it, which, together with the tide water which now enters and leaves it through the Cotuit Bay, will give as great a range of tide there as now occurs in the Cotuit Bay, the Cotuit entrance would still have its full volume of tidal flow, the new entrance taking only the volume given by the increased tidal capacity caused by the direct connection with the Sound. After making many inquiries and calculations, I have finally fixed on a channel with a maximum width of 175 feet and a depth of 3 feet at mean low water, with jetties at its mouth extending to a depth of 4 feet at mean low water in the Sound; the width of 175 feet to extend through the beach from low water on the outside to the edge of marsh on the inside. This part should be protected by timber bulkheads. The jetties on the outside to gradually diverge from the low-water line, so as to be 200 feet apart at their outer ends. The channel in the bay to be excavated 225 feet wide on the bottom, and to extend from the edge of the

marsh at the end of the cut through the beach about 2,000 feet into the bay, in a north-easterly direction, to where there is at present a depth of 3 feet at mean low water. This channel, with tidal velocities on an average tide equal to those which were measured in the main channel of the Cotuit entrance, would allow 13,000,000 cubic feet to pass through it on an average tide. The increase in the tidal volume, which can be obtained by giving freer access between the South Bay and the Sound, is 10,300,000 cubic feet for the South Bay and 1,500,000 cubic feet for the North Bay. The changes in the other bays will probably be too small to seriously affect the result, the tendency being to increase the tidal volume in each case. If such a cut is made and the sides thoroughly protected, I think that the effect on the entrance at Cotuit will be so immaterial as not to influence navigation, though, at the same time, I wish to call attention to the statement which I have previously made, that the Cotuit entrance is liable in a very short time to have its available navigable depth materially reduced from existing causes.

In considering the best location for the proposed cut, two places have suggested themselves: One through the beach at the head of Eel River, "Between the Necks" so called, which is the place described in the petition to the Legislature, and the other through the beach on the westerly side of Dead Neck near the head of Sepuit River. As before stated, the beach at each place slopes down rapidly nearly to the level of 3 feet below low water. Beyond this slope the increase in depth is a little more rapid at the west side of Dead Neck than at the Eel River location. The amount of excavation required through the beach and to the 3-foot curve on the outside beach is about the same in either case. The total excavation required is 18,000 cubic yards greater on the west side of Dead Neck than on the Eel River side. On the west side the bay is open and the wind has a free sweep across it, especially from the southwest, which is the prevailing summer wind. The Eel River is very narrow, there being a distance of only 200 to 300 feet between the trees lining the banks on either side; these trees intercept the wind to such an extent that sail-boats would have to be rowed or poled through it most of the time, even in windy weather, while on the west side of Dead Neck, the wind being comparatively unobstructed, they could sail in and out freely. The amount of jetty work would not be materially different in either location, — probably a little less on the west side. Taking everything into consideration, it seems to me that the best location for the cut is a section of the beach owned by the proprietors of Grand Island, and situated just west of Dead Neck. If this location is

adopted, it will also do away with any question of damages to be claimed by the owner of Dead Neck on account of cutting off his access to the same from the main land.

The methods to be adopted in excavating the proposed channel and in providing for its maintenance require much study and consideration. Any simple excavation through the beach, with the expectation that the tidal current will scour out a navigable channel, will probably result in failure, as the material drifting along the shore and scoured out by the current would undoubtedly form bars around the mouth, which would render it useless for purposes of navigation, even if it did not completely close it. Owing to the small rise and fall of the tide, the volume of water which will pass in and out of such an entrance will be comparatively small; and in a channel of sufficient size for the purposes of navigation, the velocity of the currents must necessarily be small, so that we cannot rely on the currents — whose maximum velocity would probably never exceed 3 feet per second and whose average maximum velocity will probably be less than 2 feet per second — to do much more than maintain a channel which has been artificially excavated. In order to direct this current so that it shall disperse material which may be drifted across the channel along the shore and also as far as possible to intercept such material and prevent its entering the channel, it will be necessary to build jetties extending for a considerable distance out into the Sound on each side of the channel; these should extend out to where the depth of water is such that the bottom is not materially disturbed by the waves; in this case I think that it would be sufficient to extend the jetties about 500 feet from high-water mark to where the depth is not less than 4 feet at mean low water. These should be built of stone, to be permanent; but, from the success which has been had with timber jetties along the coast to the eastward of this locality, and as the best dimensions for the proposed channel may be shown by experience to be somewhat different from those first adopted, I recommend that the jetties here should be built at first of piles and timber, with the expectation that when they are weakened or destroyed by the action of decay and the worms they can be replaced by stone, and the permanent work can probably be done more cheaply then than at the present time, as the vessels bringing the stone will at that time have the advantage of the deep water of the new channel and the protection afforded by the timber jetties. A timber jetty will probably last at least four or five years, which will doubtless be long enough to determine whether the new entrance is of sufficient value to warrant the additional expenditure for a more permanent construction.

I have made the following estimates of the cost of construction of such a channel, with the necessary timber jetties to protect the sides of the cut through the beach and to protect the entrance from the drift of sand along the beach.

Estimate for Channel 175 Feet Wide.

550 oak piles, 12 to 20 feet long, in place,		$2,240 00
67 M spruce timber, at $18,		1,206 00
6,000 pounds bolts and nails, at 3 cents,		180 00
Labor,		1,500 00
		$5,126 00
Plus 10 per cent.,		513 00
		$5,639 00
Excavation: —		
50,000 cubic yards, at 30 cents,	$15,000 00	
Plus 10 per cent.,	1,500 00	
		16,500 00
		$22,139 00

The depth of this channel was fixed by the depth of water required for boats used in this locality, and the width is the maximum width to which a channel of this depth could be excavated without liability to injure the Cotuit entrance. If a channel of less width was excavated, the volume of water which could pass in and out with each tide would be less, and no disturbance to the currents in Cotuit harbor would result therefrom. The boats which are used in this locality are small, and, in order to reduce the expense of the work, I would suggest that the width of the channel to be constructed should be fixed at 100 feet, which would enable the boats to pass in and out freely, except when the wind is dead ahead.

In accordance with this recommendation, I have made the following estimate for a channel 100 feet wide, the other conditions being the same as those in the first estimate: —

Estimate for Channel 100 Feet Wide.

550 oak piles, 12 to 20 feet long in place,		$2,240 00
67 M spruce timber, at $18,		1,206 00
6,000 pounds bolts and nails, at 3 cents,		180 00
Labor,		1,500 00
		$5,126 00
Plus 10 per cent.,		513 00
Excavation: —		
25,000 cubic yards, at 30 cents,	$7,500 00	
Plus 10 per cent.,	750 00	
		8,250 00
		$13,889 00

The following are the statistics of the work done in making the surveys: —

Triangulation stations occupied,	28
Triangulation stations determined,	29
Shore lines surveyed (miles),	8
Lines of soundings run (miles),	83
Number of soundings taken,	11,339
Lines of levels run (miles),	13
Tide gauges established,	7
Full tides observed,	11
High and low waters observed,	430
Current stations occupied,	3
Current observations made,	542

The results have been plotted on a series of plans, on a scale of $\frac{1}{5000}$. In addition, a plan of the South Bay has been plotted on a scale of $\frac{1}{2000}$, for the purpose of studying the best location for the proposed cut. A number of other diagrams of tidal and current observations have also been made.

Respectfully submitted,

FRANK W. HODGDON,
Engineer.

[B.]

[See page 7 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT MADE THIS FIFTEENTH DAY OF NOVEMBER, IN THE YEAR EIGHTEEN HUNDRED AND NINETY-SEVEN, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS, WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND SETH PERKINS OF BOSTON, JOSEPH E. WHITE OF QUINCY, IN THE COMMONWEALTH OF MASSACHUSETTS, AND JOHN J. O'BRIEN, OF THE CITY, COUNTY AND STATE OF NEW YORK, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The contractor hereby covenants and agrees with the Commonwealth to provide all the materials and labor and to do and complete all the work necessary and proper to build a solid pier or wharf with stone retaining walls on South Boston flats in Boston harbor, and to do and complete the same in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "engineer" when used herein shall mean the engineer of the Board of Harbor and Land Commissioners, acting directly or through his properly authorized agents, such agents acting within the scope of the particular duties intrusted to them.

Specifications.

The contractor is to furnish all the plant, tools, appliances, labor and materials necessary to build and complete the pier or wharf and connect it with the adjacent filled land of the Commonwealth, including all temporary structures required for locating or marking the position of the work or any of its parts, in the following manner, to wit: —

The pier is to be located on the South Boston flats, east of and nearly parallel with Pier No. 4 of the New England Railroad Company, leaving a dock or slip about 362 feet wide between the walls of the two piers. It is to consist of a granite sea wall, resting on a pile foundation, strengthened by stone and gravel ballast, with the area enclosed by the sea wall filled solid to grade 14 feet above mean low water, with material dredged in preparing the foundations of the sea wall and from the docks on either side of the pier and at the end of the pier.

A plan on file in the office of the Board of Harbor and Land Commissioners, marked "Plan of pier to be built at South Boston flats, under the provisions of chapter 513, Acts of 1897, October 1897," and signed by Frank W. Hodgdon, engineer, shows the location, size and method of construction of the pier, and is referred to and made a part of these specifications, and is to be followed in all details not otherwise mentioned herein.

Foundation.

The flats on the site of the proposed wall and platform in front of it to be excavated to the lines shown on the plan, the excavation to be extended, at the depth of 30 feet below mean low water, to a line at least 15 feet beyond the face of the proposed platform, as shown on the plan; the excavation to be made as nearly as may be to the required lines and grades. For the wall across the outer end of the pier, and for a distance of 100 feet therefrom, up each of the side walls, the excavation immediately under the wall to be carried to a depth of 20 feet below mean low water, instead of 15 feet, as in the balance of the work. The material excavated to be used for filling the area inclosed by the walls.

In the excavation so made spruce piles are to be driven in straight rows across the wall, each row to consist of five piles spaced equally and to measure 8½ feet from outside to outside of end piles. The rows to be 2½ feet apart on centres. In each space between the rows an inclined spur pile to be driven, as shown on the plan.

The piles to be of spruce, sound, straight and free from large knots, and to be not less than 10 inches in diameter at the butt when cut off, and not less than 6 inches in diameter at the point when ready for driving. They are to be driven to a firm bearing not less than 15 feet into the clay and not less than 35 feet below mean low water in any case. All piles injured in driving or otherwise, or not driven in their proper places or out of line, to be removed and replaced by sound ones, at the expense of the contractor, if required by the engineer.

A spruce plank 4 by 10 inches, running the whole length of the wall for the spur piles to abut against, to be securely spiked to the front side of the middle pile in each row, with its upper edge level with the tops of the piles when cut off, and the spur piles to be fitted so as to have a firm bearing against it. All piles to be cut off even and level 6 inches below mean low water.

The main piles to be capped crosswise of the wall with 6 by 12 inch spruce timber, each stick to extend the whole width of the foundation, to be fitted so as to wholly cover and have full bearing on

all the piles in its row and to be securely fastened to the piles with 1½-inch oak treenails twelve inches long, one treenail in each pile.

Each inclined pile to be capped with a piece of the same timber, not less than 3 feet long, fitted and fastened in the same manner as the caps on the main piles. The caps to be covered with a flooring of spruce plank 3 inches thick and 8½ feet wide, securely spiked to the caps with ⅞-inch wrought-iron ship spikes 6 inches long. No plank to be less than 8 inches wide.

The space between the piles and in front and rear of the same to the lines shown on the plan, extending nearly to the face of the proposed platform, to be filled with small chip stone or coarse gravel, except that the face of the slope in front of the wall, to the depth of from 18 inches to 3 feet, to be larger stone, weighing from 100 to 500 pounds, as shown on the plan. If gravel is used, at least 20 per cent. of its bulk to consist of stones having a diameter of at least 2 inches. The ballast around the piles and caps to be well rammed, and special care to be taken in doing this work not to displace any of the piles and to leave no voids around them or under the planking. The ballast back of the wall to the lines shown on the plan to consist of chip stones of such sizes as will pack closely and prevent the filling from working through the wall. If in depositing the filling back of the wall the upper portion of the ballast should be washed or pushed out of place, the ballast must be replaced, at the expense of the contractor, by other equally good material, so that upon the completion of the work there shall at no place be a thickness of less than 18 inches of ballast back of the wall.

Sea Wall.

The sea wall to extend from the bulkhead on the easterly line of the New England Railroad Company's property, about 225 feet across the end of the proposed dock or slip, then around the pier and across the end of a proposed dock or slip on the easterly side of the proposed pier to a point 200 feet easterly from the face of the side wall. The masonry to be eight feet wide at its base on the timber foundation and 4½ feet wide at its top, at grade 14 feet above mean low water, and to be built of good quality granite-quarry stone laid without mortar, the stones to be of large size, of from 1 to 3 feet in thickness, laid compactly, with good bond and full to line and grade, all the work to be done in the best manner by skilled workmen, and to have all the interstices between the stones filled solid with pinners. At least one-fourth of the stones showing in the face of the wall to be headers extending well back into the body of the wall back of the stretchers. The stones in the foundation course to be of large size, not less than 18 inches

thick, with fairly parallel beds and builds, laid with best face down on the timber foundation.

All stones in the face of the wall to have full bearing at the face without the use of pinners. The top or cap stones to extend the full width of the wall, to be not less than 18 inches thick in any part, and not less than 3 feet wide, the top surface to be split true and laid level at grade 14 feet above mean low water.

Bulkhead.

The gap left between the present bulkhead and the easterly end of the proposed sea wall to be closed by a bulkhead of spruce piles and timber, like the bulkhead which now incloses the filled portion of the Commonwealth's land.

Filling.

The area inclosed by the above-described sea wall and bulkhead, and lying between them and the existing bulkheads inclosing the filled portion of the South Boston flats, to be filled to the level of 14 feet above mean low water; first, with the material dredged in preparing the foundation for the sea wall, any additional material required to be dredged from the docks on either side of the proposed pier or from the harbor in front of the pier and docks at such places and to such depths, not exceeding 35 feet below mean low water, as may be prescribed by the engineer. All areas dredged over to be left smooth and level at the depth prescribed, and the contractor will not be required to dredge over any more area than is necessary in order to obtain the material required to complete the filling. If in the course of the dredging any ledges or boulders are found which can be removed by dredging, they are to be removed without extra payment or allowance; but if any are found which cannot be so removed, the covering material is to be dredged away and the ledges or boulders left bare to the depth of the excavation required at that place. The engineer to be the sole judge to determine whether any ledge or boulder can be removed by dredging or not.

In depositing the filling against the back ballast of the sea wall, and for a distance of 50 feet in rear of the same, great care must be used not to crowd out the wall or unnecessarily strain it in any way; and the method of doing this work must be at all times and in every detail subject to the approval and direction of the engineer.

In placing the dredged material upon the area inclosed by the walls, any method which requires that it be mixed with a large volume of water, as is done by the so-called hydraulic or suction dredges, will not be approved.

Quality of Timber.

All timber to be of spruce, sound, sawed square, of full size, even thickness, and free from large knots.

Plane of Reference.

The plane of mean low water referred to in these specifications is that established and used in the work of the improvements on the South Boston flats.

Other Contracts.

If during the continuance of this contract the Commonwealth shall proceed, by contract or otherwise, to build the platform designed to surround the face of the sea wall to be built under this contract, the same may be built without in any way affecting the terms and conditions of this contract; and it is hereby agreed that in the construction of such platform due regard shall be maintained for the rights and conveniences of each party by the other, and nothing shall be done to hinder or delay the progress of the work contemplated, but on the other hand, each party will do everything that under the circumstances is reasonably right and proper to facilitate the work of the other.

General Clauses.

The work shall be done so as not to interfere with the use of the wharf and dock of the New England Railroad Company, which adjoin the location of the pier herein contracted for.

Upon the completion of the work the contractor to remove from the premises all materials and refuse left from the construction, and to leave the premises in a condition satisfactory to the engineer.

The aforesaid plans, and the surveys, soundings and borings, with the calculations based thereon, are believed to be correct; but the contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein, and the Commonwealth does not guarantee them to be even approximately correct.

The drawings and specifications are intended to be explanatory of each other; but should any discrepancy appear, or misunderstanding arise as to the import of anything contained in either, the explanation and determination of the engineer shall be considered final and binding on the contractor. Any errors or omissions in drawings or specifications may be corrected by the engineer, such correction to govern all work only from the time that the engineer gives notice in writing thereof.

In all questions which may arise concerning measurement, lines and grades, or of interference with other work or contractors, the decision of the engineer to be final. All lines and grades will be given by the engineer, but all necessary aid and materials for giving or indicating them to be furnished by the contractor at his own expense, and the marks given shall be carefully preserved.

Any materials condemned or rejected by the engineer may be branded or otherwise marked, and shall, on demand, be at once removed from the work.

Any unfaithful or imperfect work which may be discovered before the final acceptance of the completed structure shall be corrected immediately, and any unsatisfactory materials delivered shall be rejected on the requirement of the engineer, notwithstanding that they may have been overlooked in previous inspection. The inspection of the work shall not relieve the contractor of any of his obligations to perform good work as herein described; and all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be removed and replaced by good and satisfactory work at the expense of the contractor, and all completed work shall be maintained by him in good condition until the final acceptance of the whole work.

The contractor hereby agrees to do such extra work in connection with the construction of the pier as may be ordered in writing by the Board of Harbor and Land Commissioners, and to accept in payment for the same, its reasonable cost as estimated by the engineer, plus 15 per cent. of said estimated cost.

The contractor to have no claim for compensation for extra work unless the same is ordered in writing by said Board, and unless the claim for the same is presented to said Board before the fifteenth day of the month following that during which each specific order is complied with.

Convenient facilities for the inspection of the work shall be furnished by the contractor whenever requested by the engineer. All instructions and directions of the engineer to be strictly observed and followed, and when the contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of that particular work in reference to which they are given.

All of the work to be done to the satisfaction of the engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board and not otherwise.

The work to be commenced as soon as practicable and to be

prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the first day of February, 1899.

In all operations connected with the work the contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work; and in the employment of mechanics and laborers in the construction of the work herein contracted for preference shall be given by the contractor to citizens of the United States.

The contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or relating to any act, omission or neglect of the contractor or his employees therein.

If the work to be done under this contract shall be abandoned by the contractor, or if the engineer at any time shall be of opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the contractor is violating any of the provisions of this contract, said Board may notify the contractor to discontinue the work; and the contractor shall thereupon discontinue said work, and the Commonwealth may, after the said notice, complete the work by contract or otherwise, and may pay the expense of the same, so far as may be, out of any moneys then due or to become due the contractor under this contract. In case such expense is less than the sum which would have been payable under this contract if the same had been completed by the contractor, the contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the contractor shall pay the amount of such excess to the Commonwealth.

The Harbor and Land Commissioners, for the Commonwealth, may retain out of any amounts due the contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others for work done or materials furnished under this contract; *provided*, that notice in writing of such claims, signed by the claimants, shall have been previously filed with the commissioners.

It is agreed that time is of the essence of this contract, and that damages for a breach of the time covenant agreement may be assessed at the rate of $100 for each and every day of failure on the part of the contractor to complete the same after Feb. 1, 1899, and deducted from the final payment to be made hereunder.

Estimates to be made by the engineer at the end of each calendar month of the value of the work completed in place, and payment to be made thereon of 85 per centum of the value of said work, as computed by the engineer, the remaining 15 per centum to be paid upon the final completion and acceptance of the whole work, except as hereinbefore provided.

And the Commonwealth of Massachusetts, in consideration of the performance and completion by the contractor of all of said work in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the contractor the sum of one hundred ninety-eight thousand four hundred and sixteen dollars ($198,416), in full therefor, at the times and in the manner and upon the terms and conditions hereinbefore set forth.

In witness whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be signed and delivered in its name and behalf, and the seal of the Commonwealth to be hereto affixed, and has also caused these presents to be approved by the Governor and Council; and the said Seth Perkins, Joseph E. White and John J. O'Brien have hereunto set their hands and seals.

THE COMMONWEALTH OF MASSACHUSETTS,

By Woodward Emery, } *Harbor and Land*
Clinton White, } *Commissioners.*

SETH PERKINS.
JOSEPH E. WHITE.
JOHN J. O'BRIEN.

Commonwealth of Massachusetts.

In Council, Nov. 17, 1897.
Approved:

Edward F. Hamlin,
Executive Clerk.

Witness the seal of the Commonwealth:

Wm. M. Olin,
Secretary.

[seal of the commonwealth.]

[C.]

[See page 5 of this report, *ante*]

CONTRACT.

The Bay State Dredging Company, by Augustus B. Martin, its proprietor, hereby agrees with the Commonwealth of Massachusetts, acting by its Board of Harbor and Land Commissioners, to dredge a certain portion of the material, not exceeding four thousand (4,000) cubic yards, now lying on the flats easterly of the bulkhead on the easterly side of the 70-acre lot north of Congress Street on the South Boston flats, and to deposit the same on the filled land inside of and adjoining said bulkhead.

In all questions which may arise concerning measurements, lines or grades, the decision of the engineer of said Board to be final.

Convenient facilities for the inspection of the work to be furnished by the contractor whenever requested by the engineer. All instructions and directions of the engineer to be strictly observed and followed, and, when the contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board.

The work to be commenced at once, and prosecuted vigorously until its completion.

In all operations connected with the work, the contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work; and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work; and in the employment of mechanics and laborers in the construction of the work herein contracted for, preference shall be given by the contractor to citizens of the United States.

The contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished

for the work, or to inventions, patents or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or to any act, omission or neglect of the contractor or his employees therein.

And the Commonwealth of Massachusetts, in consideration of the performance and completion by the contractor of all of said work in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the contractor the sum of sixty-five dollars ($65) for each day (of two tides each) that the company's dredge is employed upon the work, except that, in case the average quantity of material excavated and deposited per day, with the dredge working on both tides, should fall below three hundred and fifty (350) cubic yards, the said price of sixty-five dollars ($65) shall be reduced by such proportional amount as such average quantity actually dredged is less than said three hundred and fifty (350) cubic yards; the same to be in full therefor and to be paid upon the final completion and acceptance of the whole work.

In witness whereof, on the eleventh day of March, in the year one thousand eight hundred and ninety-seven, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be signed and delivered in its name and behalf and the seal of the Commonwealth to be hereto affixed, and has also caused these presents to be approved by the Governor and Council; and the said Augustus B. Martin, the proprietor of said Bay State Dredging Company, has hereunto set his hand and seal.

THE COMMONWEALTH OF MASSACHUSETTS,

By Chas. H. Howland, } *Harbor and Land*
Clinton White, } *Commissioners.*

A. B. MARTIN. [seal.]

Commonwealth of Massachusetts.

In Council, March 18, 1897.

Approved:

Edward F. Hamlin,
Executive Clerk.

Commonwealth of Massachusetts.

Office of the Secretary.

Witness the seal of the Commonwealth:

Wm. M. Olin,
Secretary.

[seal of the commonwealth.]

[D.]

[See page 6 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS TWENTIETH DAY OF MAY, IN THE YEAR EIGHTEEN HUNDRED AND NINETY-SEVEN, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS, WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND HIRAM W. PHILLIPS OF QUINCY, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The contractor hereby covenants and agrees with the Commonwealth to do and complete all the work necessary and proper to excavate and remove a ledge of rock in the channel leading to Burnham's wharf on the South Boston flats, all the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "engineer" when used herein shall mean the engineer of the Board of Harbor and Land Commissioners, acting directly or through his properly authorized agents, such agents acting within the scope of the particular duties intrusted to them.

Specifications.

The contractor to furnish all the plant, tools, appliances, labor and materials necessary to excavate and remove the ledge and dispose of the excavated material in the manner hereinafter prescribed.

The ledge to be removed is located in the easterly side of the channel leading to the wharf occupied by L. G. Burnham & Co. on the Commonwealth's flats at South Boston, and about 120 feet outside of the United States harbor line on the northerly side of said flats. It covers an area above the plane of 18.5 feet below mean low water of about 360 square feet, and is estimated to contain 47 cubic yards of rock above that plane. Its extreme length is about 30 feet, and it is about 12 feet in width. The least depth over it at mean low water is about 14.6 feet.

A plan on file in the office of the Board of Harbor and Land Commissioners, marked "Plan of ledge in Burnham's Channel, South Boston flats, April, 1897, scale $\frac{1}{60}$," and signed by Frank W. Hodgdon, engineer, gives the location and dimensions of the ledge in detail. Said plan is referred to and made a part of said specifications.

The above-described ledge is to be removed so that, upon the completion of the work herein contracted for, there will be a depth of not less than 18.5 feet of water over each and every portion of it at mean low water, but no extra payment will be allowed for any excavation below the required depth.

The rock or other material excavated or disturbed by the blasting or other means adopted for its removal shall be deposited in such place or places as may be approved by the engineer of said Board, and no portion of it shall be allowed to remain in said channel above the plane of 18.5 feet below mean low water or on the flats in the immediate vicinity of said ledge.

The aforesaid plan and the surveys and calculations based thereon are believed to be correct; but the contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein.

In all questions which may arise concerning measurements, lines and grades, the decision of the engineer to be final. All lines and grades will be given by the engineer; but all necessary aid and materials for giving or indicating them to be furnished by the contractor at his own expense, and the marks given shall be carefully preserved.

Convenient facilities for the inspection of the work to be furnished by the contractor whenever requested by the engineer. All instructions and directions of the engineer to be strictly observed and followed; and when the contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All the work to be done to the satisfaction of the engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board.

The work to be commenced as soon as practicable, and to be prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the thirty-first day of July, 1897, and will be paid for upon its completion.

In all operations connected with the work, the contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the

work; and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work; and in the employment of mechanics and laborers in the construction of the work herein contracted for, preference shall be given by the contractor to citizens of the United States.

The contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or to any act, omission or neglect of the contractor or his employees therein.

If the work to be done under this contract shall be abandoned by the contractor, or if the engineer at any time shall be of opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the contractor is violating any of the provisions of this contract, said Board may notify the contractor to discontinue the work, and the contractor shall thereupon discontinue said work, and the Commonwealth may thereupon complete the work by contract or otherwise, and may pay the expense of the same so far as may be out of any moneys then due or to become due the contractor under this contract. In case such expense is less than the sum which would have been payable under this contract if the same had been completed by the contractor, the contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the contractor shall pay the amount of such excess to the Commonwealth.

And the Commonwealth of Massachusetts, in consideration of the performance and completion by the contractor of all of said work in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the contractor the sum of seven hundred and seventy seven (777) dollars in full therefor, at the time and in the manner and upon the terms and conditions hereinbefore set forth.

In witness whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be signed and delivered in its name and behalf, and the seal of the Common-

wealth to be hereto affixed, and has also caused these presents to be approved by the Governor and Council; and the said Hiram W. Phillips has hereunto set his hand and seal.

THE COMMONWEALTH OF MASSACHUSETTS,

By WOODWARD EMERY, CLINTON WHITE, *Harbor and Land Commissioners.*

HIRAM W. PHILLIPS. [SEAL]

COMMONWEALTH OF MASSACHUSETTS.

In Council, May 27, 1897.

E. F. HAMLIN,
Executive Clerk.

[SEAL OF THE COMMONWEALTH.]

OFFICE OF THE SECRETARY, May 27, 1897.

Witness the seal of the Commonwealth:

WM. M. OLIN,
Secretary of the Commonwealth.

[SEAL OF THE COMMONWEALTH.]

[E.]

[See page 35 of this report, *ante*.]

REPORT OF THE SUPERINTENDENT, PROVINCE LANDS.

PROVINCETOWN, MASS., Dec. 1, 1897.

To the Board of Harbor and Land Commissioners.

GENTLEMEN: — As Superintendent of the Province Lands I respectfully submit the following report for the year ending Nov. 30, 1897: —

Our season's work commenced about the middle of April with the transplanting of shrubs and young trees from the nursery along the base of the outer range of sand hills, extending the work eastward from that of previous years and opposite the beach-grass work of the season of 1896. In this locality there were transplanted about 35,000 young pines, 5,000 silver poplars, 4,000 tamarisk, 500 locust and 2,000 Scotch broom (*Genista scoparia*). Of the young pines transplanted, about one-half were of one year's growth and the other half were of two and three years' growth, from seed planted in the nursery, and consisted of four varieties, viz.: native pitch pine (*Pinus rigida*), seaside pine (*Pinus maritima*), Scotch pine (*Pinus sylvestris*), and Austrian Pine (*Pinus Austriaca*). Excellent results have been obtained in transplanting the above varieties, with the exception of the seaside pine, which has not borne transplanting with a great degree of success, not more than 10 per cent. living, while of the other varieties 80 per cent. survived transplanting, made fine growth during the season and are now in excellent condition. The poplars, tamarisk, locust, and especially Scotch broom, show results equally as good as pines. The fine growth of the Scotch broom the past season and its present very favorable condition seem to warrant a more extensive use of this shrub in future work.

After completing the work of transplanting trees and shrubs, we commenced the work of beach-grass planting about the last of April. Beginning at the western end of the first or inner range of sand hills, extending eastward along the slope, we continued the work until June 2, and covered an area of 20 acres. In connection with the planting of beach grass, the area was covered with pine seeds of the varieties named above used in transplanting, sown broadcast over the ground as the grass planting was

going on. The result of both the grass planting and the seeding with pine has been highly satisfactory; the grass took root readily and made good growth, and the seeds germinated abundantly and withstood the dry and hot weather of the summer without detriment.

About the middle of September we resumed the work of grass planting, beginning at the point where we stopped in June, and continued eastward along the same slope, covering about 22 acres, making a total area covered by this season's work of about 42 acres, extending along the slope for a distance of about 4,000 feet. This section covered by the fall planting has also been thickly planted with acorns gathered in the adjacent woods, and which germinate and grow readily in the sands. We have also planted among the grass along the slope covered during the seasons of 1895 and 1896, with very favorable results, pine seeds of the varieties named, covering about 20 acres, also about 10 acres on the south side of the same range.

We have made use of a considerable quantity of the bayberry (*Myrica cerifera*), a shrub which grows abundantly in certain portions of the lands, is of considerable value for preliminary covering of the work, and easily survives transplanting.

We have continued work upon the nursery to a limited extent, have seeded it with pine, principally, and have now a number of young plants which will be ready for transplanting another season. The nursery is quite important, especially for the starting of such trees and shrubs as need a good root growth before transplanting into the sands on the outer beach.

Nigger Head Road, which was completed last season as far as the summit of Grand View Hill, has been extended about 400 feet in the direction of Race Point Life Saving Station. This road, as far as Grand View has been much used by the public, and in consequence some labor has been required for repairs. It is now in good condition. Other roads through the lands have been kept safe and convenient for travel at small expense.

In closing operations for the season brush has been used, as in the past, for the protection of the work done.

The planting done during the seasons of 1895 and 1896, especially seed planting, is now showing gratifying results. It was thought at the commencement that seed planting would not be a success in the sand, that the hot and dry weather of midsummer would destroy the young plants, and that we should have to depend almost entirely upon nursery stock for transplanting; but from experiments made, especially with the various kinds of pine seed, last season's results seem to prove that seed can be successfully

used, and, in connection with nursery stock, with great saving of expense and labor. A small space planted with pine seeds in the spring of 1896 shows a remarkable growth, some of the young plants attaining a growth of 10 inches; the same may be said also of about 1 acre planted with acorns, some of the young oaks making a growth of about 12 inches.

The beach-grass work already accomplished has worked in every way to our satisfaction. Throughout the whole section covered not a single break has been made by the action of the wind, and no movement of sand observed. Up to the present time about 70 acres have been covered with grass; a large part of this surface has been filled in with either trees, shrubs or seed.

The condition of the work already done will justify the statement that a continuation of the improvement upon lines pursued the past season will accomplish the reclamation of these lands of the Commonwealth.

Respectfully submitted,

JAMES A. SMALL,
Superintendent Province Lands.

[F.]

[See page 39 of this report, *ante*.]

REPORT OF E. C. AND E. E. DAVIS, ENGINEERS.

To the Honorable Board of Harbor and Land Commissioners of Massachusetts, WOODWARD EMERY, Esq., *Chairman*.

GENTLEMEN: — We herewith submit our report of work done the past season on the western bank of Connecticut River, in the town of Agawam, Mass., under the appropriation made in chapter 58 of the Resolves of the Legislature of Massachusetts in 1897.

After an examination of the river bank by your Board in August last, it was decided to expend the appropriation on the following sections of the bank and in the order named, these being places where the encroachments of the river endangered the safety of the highway and the permanency of the protective works that have been built by the State during the past three years; and we have followed the directions of your Board in the prosecution of the work.

Section 1. — A continuation of the work, up the river, from where it was stopped in 1896, in front of and above the premises of Mr. John Riley.

Section 2. — A continuation of the work, down the river, from where it was stopped in 1896, below the house of Mr. James Green.

Section 3. — A reach of the river bank in front of the premises of Mr. Sumner Clark, between sections 1 and 2.

On Section 1 the work has been extended up the river for a distance of 229 feet, to a point where the growth of trees and brush affords a natural protection to the river bank.

On Section 2 the work has been extended down the river 162 feet, on the same grades and lines established in the work of 1896, covering and protecting all that part of the bank in this locality where the river was approaching the lines of highway travel.

On Section 3 the bank has been graded and brought to a slope of 3 to 1 for a distance of 369 feet up and down the river, and protective work laid on this slope.

On all the sections the same plan of protection has been pursued as in former years: first grading the banks on straight lines and uniform slopes, and then covering the slopes with mats made of

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poles and fine brush, wired together and overlaid with riprap of broken stone.

The requirements of your contract with Mr. William H. Porter of Agawam, for furnishing stone for the riprapping, have been faithfully carried out on his part, and he has furnished 194.56 cubic yards of stone for this purpose, in compliance with the terms of the specifications for the same.

The total amount of surface covered by the protective works the past season was 2,157 square yards, costing $1,455.75, being an average cost of about 67½ cents per square yard.

The sum of $43.30 has been expended in repairs on work done in the past three years, and in turfing and covering with brush small patches on the river bank at different points where there was danger of the river breaking through the natural protection to the bank afforded by the growth of turf and small brush, making the total expenditures of the season $1,499.05, leaving an unexpended balance of the appropriation of 1897 of 95 cents.

In consideration of an arrangement made by your Board with the selectmen of Agawam, whereby the town is to furnish funds to meet the expenses of setting willows next spring, in the work done the past season no reservation of funds from the appropriation of 1897 has been made for this purpose.

The tools, ropes, etc., that have been purchased from time to time for use on the work are in the care of Mr. W. C. Campbell, the foreman employed on the work, and are subject to your orders.

In conclusion, we are of the opinion that the town of Agawam and its highways are now thoroughly protected from any further encroachments at present of the Connecticut River, and that no further appropriations will be required for this work.

Respectfully submitted,

E. C. AND E. E. DAVIS,
Engineers.

NORTHAMPTON, MASS., Dec. 7, 1897.

[G.]

[See page 36 of this report, *ante*.]

CONTRACT.

The Board of Harbor and Land Commissioners of the Commonwealth and Mr. Charles E. Davis of New Bedford agree as follows: —

Charles E. Davis will remove the wreck of the schooner "W. F. Miller," lying at the entrance of Cotuit harbor, in the town of Barnstable, so that no stick or timber thereof shall remain either below or above low-water mark, and will remove all material not destroyed on the spot to some suitable place above high-water mark, to be found by him.

The Board agree that, if said Davis removes said wreck, as aforesaid, to its satisfaction, it will pay him the sum of two hundred and fifty (250) dollars.

WITNESS our hands, this twenty-ninth day of September, 1897.

BOARD OF HARBOR AND LAND COMMISSIONERS,
By WOODWARD EMERY.
CLINTON WHITE.

CHARLES E. DAVIS.

[H.]

[See page 36 of this report, *ante*.]

CONTRACT.

The Board of Harbor and Land Commissioners of the Commonwealth and Mr. George W. Townsend of Boston agree as follows: —

George W. Townsend will remove the wreck of the sloop yacht "Galena," now lying sunken in the lower middle in Boston harbor, so that no portion thereof shall remain in tide water, and will deposit all material removed on filled portion of the South Boston flats, at such place as may be designated by the Board. Said Townsend shall use every endeavor to secure any watches, money, jewelry or other personal effects now in said wreck, and deliver the same, in as good condition as when found, to said Board, as soon as discovered.

The Board agree that, if said Townsend removes said wreck as aforesaid to its satisfaction, it will pay him the sum of forty-nine (49) dollars.

Witness our hands, this twenty-ninth day of September, 1897.

GEORGE W. TOWNSEND.

WOODWARD EMERY, } *Board of Harbor and*
CLINTON WHITE, } *Land Commissioners.*

[I.]

[See page 10 of this report, *ante*.]

COMMONWEALTH OF MASSACHUSETTS.

SUPERIOR COURT. SUFFOLK, ss.

MAYOR AND ALDERMEN OF THE CITY OF BOSTON, PETITIONERS FOR ALTERATION OF THE GRADE CROSSING OF CONGRESS STREET AND THE ROAD OF THE NEW ENGLAND RAILROAD COMPANY IN THE CITY OF BOSTON.

DECISION AND REPORT OF COMMISSION.

The commissioners heretofore appointed upon said petition, and directed, by chapter 535 of the Laws of the Commonwealth of Massachusetts for the year 1896, to "prescribe the manner in which the grade crossing of Congress Street and the railroad of the New York & New England Railroad Company (now the New England Railroad Company) shall be abolished," agreeably to the provisions of said act, decide and report as follows: —

First. — Acting under the authority given by our appointment, and under chapter 535 of the Laws of 1896, we notified the city of Boston, the New England Railroad Company and the Commonwealth that we would meet the parties interested at No. 27 School Street, in the city of Boston, on the twentieth day of June, 1896, and at that time and place we met.

The city of Boston appeared by its corporation counsel; the Commonwealth appeared by the Second Assistant Attorney-General, J. Mott Hallowell; the New England Railroad Company appeared by its counsel, J. H. Benton, Jr.; and the Boston Wharf Company appeared by its treasurer, J. B. Russell.

Upon conference with the parties who thus appeared we gave notice that we would hear all parties interested in the matter of said petition and of said act on Wednesday, the first day of July, 1896, by publishing a notice in three daily newspapers published in the city of Boston, of which the following is a copy: —

CONGRESS STREET GRADE CROSSING. — COMMISSIONERS' NOTICE.

The commissioners appointed by the superior court, on petition of the mayor and aldermen of the city of Boston, for the alteration of the crossing of Congress Street and the road of the New York & New England Railroad Company, in the city of Boston, and to whom were referred

certain matters incident to the alteration of said crossing, by chapter 535 of the Acts of the General Court of Massachusetts, for the year 1896, hereby give notice that they will meet to hear all parties interested in the matter of said petition and of said act, on Wednesday, the first day of July, A.D. 1896, at half-past ten o'clock in the forenoon, at the office of the Railroad Commissioners in said city of Boston.

GEORGE W. WIGGIN,
CHARLES A. ALLEN,
EDWARD B. BISHOP,
Commissioners.

BOSTON, June 22, 1896.

Pursuant to said notice, we met at the rooms of the Railroad Commissioners in the city of Boston on July 1, 1896, at which time the city of Boston appeared by its corporation counsel; the Commonwealth appeared by the Second Assistant Attorney-General, J. Mott Hallowell; the New England Railroad Company appeared by its counsel, J. H. Benton, Jr.; and the Boston Wharf Company appeared by its counsel, William E. Russell.

The city engineer presented a plan for the proposed alteration of the grade crossing, and after hearing the parties present, and all persons who desired to be heard, we adjourned the hearing until the sixth day of October, 1896, at the same place.

Oct. 6, 1896, we met pursuant to adjournment at the rooms of the Railroad Commissioners in the city of Boston.

The Commonwealth appeared by the Second Assistant Attorney-General; the city of Boston by Andrew J. Bailey, corporation counsel; the New England Railroad Company by J. H. Benton, Jr., its counsel; and the Boston Wharf Company by Mr. Wilson; and after hearing the parties present, and all persons who desired to be heard, we adjourned the hearing to Friday, the sixteenth day of October, 1896, at the same place.

Oct. 16, 1896, we met pursuant to adjournment at the rooms of the Railroad Commissioners in the city of Boston.

The Board of Harbor and Land Commissioners of the Commonwealth appeared by Woodward Emery, its chairman; the city of Boston by Andrew J. Bailey, corporation counsel; the New England Railroad Company by J. H. Benton, Jr., counsel; the Boston Wharf Company by C. T. Russell, counsel, and by J. B. Russell, treasurer; Thomas Cunningham, a land owner, who claimed that his interests would be affected by the proposed alteration, appeared in person; and the Walworth Manufacturing Company, a land owner which claimed that its interests would be affected by the proposed alteration, appeared by J. J. Myers, its counsel.

We heard all parties who appeared as above stated, and all persons who desired to be heard, and considered plans and estimates presented by the city engineer of the city of Boston for the proposed alteration, and then adjourned the hearing until the twenty-sixth day of October, at the same place.

Oct. 26, 1896, we met pursuant to adjournment at the rooms of the Railroad Commissioners in the city of Boston.

The Commonwealth appeared by the Second Assistant Attorney-General; the city of Boston appeared by its corporation counsel; the railroad company appeared by J. H. Benton, Jr., its counsel; the Boston Wharf Company appeared by C. T. Russell, its counsel, and by J. B. Russell, its treasurer, and the three street commissioners of Boston appeared in person.

And after hearing all parties who appeared as above stated, and all persons who desired to be heard, we adjourned the hearing until the tenth day of November, 1896, at the office of George W. Wiggin, chairman of the commissioners, in the Tremont building in the city of Boston.

Pending these adjournments, we personally visited and inspected the crossing and the locality affected by the alteration thereof at several times.

On the 10th of November, 1896, the commissioners met pursuant to adjournment, and prescribed the manner in which said crossing shall be abolished, as follows, to wit: —

Discontinuance of Street.

That portion of Congress Street east of a point on that street about three hundred eighty-eight and eighteen one-hundredths (388.18) feet east of the easterly boundary of A Street over the railroad and land of the New England Railroad Company to the westerly side line of B Street is discontinued, except that the city of Boston shall have the right to construct and maintain necessary sewers and water pipes therein.

Substitute Street.

In substitution of that portion of Congress Street hereinabove discontinued, and as an adequate substitute therefor, a new street and approaches thereto are hereby located, said approaches being necessary in our judgment to render such new street an adequate substitute for that portion of Congress Street which is hereinabove discontinued, and an adequate substitute "for any other existing public ways across the lands or railroad of the New England Railroad Company northerly of West First Street, except Northern Avenue, as heretofore required to be constructed."

DESCRIPTION OF NEW STREET.

Said new street begins at a point eighty (80) feet distant north-westerly from and at right angles to the harbor line on the westerly side of Fort Point Channel, and three hundred and twelve and five one-hundredths (312.05) feet distant south-westerly from the southerly line of Congress Street as now located, measured on a line distant at right angles eighty (80) feet from and parallel with the said harbor line.

The northerly side line of said new street runs from said point south-easterly across Fort Point Channel and land on the easterly side thereof two thousand three hundred eighty-eight and eighty-four one-hundredths (2,388.84) feet to a point in the westerly side line of B Street twenty-two and forty-eight one-hundredths (22.48) feet southerly from the southerly side line of Congress Street, as now located; from said last-named point the northerly side line of said new street runs south-easterly about eleven hundred seventy-one and five one-hundredths (1,171.05) feet to a point twelve and five-tenths (12.5) feet northerly from and at right angles to the northerly side line of Congress Street as now located, extended in the same course five hundred and sixty-five (565) feet easterly from the most easterly point in said northerly line of Congress Street; and from said last-named point the northerly side line of said new street runs south-easterly about fourteen hundred sixty-two and twenty-two one-hundredths (1,462.22) feet to a point in the bulkhead line on the northerly side of the "Reserved Channel," distant fifty (50) feet at right angles from the centre line of "L Street bridge."

The southerly side line of said new street runs from a point in said bulkhead line one hundred forty-eight and fifty-nine one hundredths (148.59) feet westerly from the intersection of said northerly side line with said bulkhead line north-westerly parallel to and one hundred (100) feet from said above-described northerly side line about forty-eight hundred eighty-six and seventy-two one-hundredths (4,886.72) feet to a point eighty (80) feet distant north-westerly at right angles from the aforesaid harbor line of Fort Point Channel.

DESCRIPTION OF APPROACHES.

First Approach.

The first approach required, as hereinabove stated, is located as a public way, and bounded and described as follows, viz.: —

Beginning at a point in the south-easterly side line of Atlantic

avenue as now located, at the intersection of said side line with the south-westerly side line of Congress Street as now located, the westerly side line of said approach runs in the south-westerly side line of Congress Street five hundred thirty-four and eighty-nine one-hundredths (534.89) feet to a point distant eighty (80) feet north-westerly at right angles from the harbor line on the westerly side of Fort Point Channel; thence said side line runs south-westerly three hundred twelve and five one-hundredths (312.05) feet parallel to and eighty (80) feet from the said harbor line of Fort Point Channel to the north-easterly side line of said new street as hereinabove located and described.

The easterly side line of said approach begins at a point in the south-easterly side line of Atlantic avenue as now located about eighty and twenty-three one-hundredths (80.23) feet north-easterly in said side line of Atlantic avenue from the point begun at in the above description of the westerly side line, and runs thence south-easterly parallel to and eighty (80) feet from said westerly side line about five hundred seventy-nine and twenty-one one-hundredths (579.21) feet to the said harbor line of Fort Point Channel; thence on said harbor line about three hundred sixty-nine and twenty-six one-hundredths (369.26) feet to the north-easterly side line of said new street as above located and described.

Second Approach.

The second approach required as hereinabove stated is located as a public way, and bounded and described as follows, viz.: —

Beginning at a point in the westerly side line of A street as now located one hundred sixty (160) feet southerly from the southerly side line of said new street as hereinabove located and described, the north-easterly side line of said approach runs north-westerly about five hundred seventeen and seventy-nine one-hundredths (517.79) feet to a point sixty (60) feet measured at right angles from the southerly side line of said new street; thence by a curve of sixty (60) feet radius about eighty-three and seventy-two one-hundredths (83.72) feet to the southerly side line of said new street.

The south-westerly side line of said approach begins at a point in the southerly side line of said new street seventy-four and ninety-five one-hundredths (74.95) feet north-westerly from the intersection of said north-easterly side line of said approach with the southerly side line of said new street, and runs south-easterly in a straight line about sixty-one and seventy-three one-hundredths (61.73) feet to a point distant sixty (60) feet at right angles from the north-easterly side line of said approach above described;

thence south-easterly sixty (60) feet from and parallel to said north-easterly side line about six hundred forty and fifty-seven one-hundredths (640.57) feet to the westerly side line of A Street.

Third Approach.

The third approach, required as hereinabove stated, is located as a public way, and bounded and described as follows: —

Beginning at a point on the northerly line of Congress Street as laid out by the street commissioners, March 14, 1879, fifty-five (55) feet westerly on said line from the easterly end thereof, one side line of said approach runs southerly at right angles to said northerly line of Congress Street four hundred ten and sixty-two one-hundredths (410.62) feet; thence easterly at right angles six hundred twenty (620) feet; thence northerly at right angles to the last-described line three hundred twenty-two and sixty-seven one-hundredths (322.67) feet to the southerly line of said new street, as hereinbefore located and described.

The other side line of said approach begins at a point on the prolongation of the said northerly line of Congress Street, five (5) feet easterly from the easterly end thereof, and runs southerly at right angles to said northerly line of Congress Street, three hundred sixty and sixty-two one-hundredths (360.62) feet; thence easterly at right angles to the last-described line, four hundred eighty (480) feet; thence northerly at right angles to the last-described line, two hundred sixty-five and thirteen one-hundredths (265.13) feet to the southerly line of said new street as hereinbefore located and described.

GRADES.

Said new street and approaches are hereby laid out and are to be constructed at the following described grades, viz.: —

Grades of New Street.

The grade of the southerly curb of the new street begins at the most westerly point thereof at an elevation of twenty-two and fifty one-hundredths (22.50) feet above the Boston city base; thence the grade runs by an ascending grade not exceeding one and seventy-five one-hundredths (1.75) feet per hundred feet for about eighty and thirty-three one-hundredths (80.33) feet to elevation twenty-three and thirty-eight one-hundredths (23.38) feet; thence by an ascending grade of one and seventy-five one-hundredths (1.75) feet per hundred (100) feet about sixty-nine and seventy-one one-hundredths (69.71) feet to elevation twenty-four and sixty one-hundredths (24.60) feet; thence by a vertical curve eighty-two and fifty one-hundredths (82.50) feet to elevation twenty-five and

fifty one-hundredths (25.50) feet; thence level three hundred forty-six and fifty-seven one hundredths (346.57) feet; thence by a vertical curve ninety-nine and eighty-one one-hundredths (99.81) feet to elevation twenty-six and ninety-two one-hundredths (26.92) feet; thence by an ascending grade of one and seventy-five one-hundredths (1.75) feet per one hundred (100) feet five hundred forty-seven (547) feet to elevation thirty-six and fifty one-hundredths (36.50) feet; thence by a vertical curve seventy (70) feet to elevation thirty-seven and twenty-five one-hundredths (37.25) feet; thence by an ascending grade of ninety one-hundredths (0.90) feet per one hundred (100) feet three hundred forty-five (345) feet to elevation forty and thirty-seven one-hundredths (40.37) feet; thence by a vertical curve of thirty (30) feet to elevation forty and fifty one-hundredths (40.50) feet; thence level to the westerly line of B Street, so called; thence by a vertical curve eighty (80) feet to elevation forty and twenty one-hundredths (40.20) feet; thence by a descending grade of about seventy-four one-hundredths (0.74) feet per one hundred (100) feet four hundred sixty-eight (468) feet to elevation thirty-six and seventy-two one-hundredths (36.72) feet; thence by a vertical curve of sixty (60) feet to elevation thirty-six and five one-hundredths (36.05) feet; thence by a descending grade of one and fifty one-hundredths (1.50) feet per one hundred (100) feet thirteen hundred and six and sixty-six one-hundredths (1,306.66) feet to elevation sixteen and forty-five one-hundredths (16.45) feet; thence by a vertical curve of sixty (60) feet to elevation sixteen (16) feet; thence level to the present grade of L Street bridge.

The grade of the northerly curb of the new street is the same as described for the southerly curb, except where it may be necessary to modify it in order that the curbs may be at the same elevation on opposite sides of the street.

Grade of First Approach.

The grade of the first approach above described begins at a point in the south-easterly side line of Atlantic Avenue, and runs at the grade of Congress Street as now established, to the harbor line on the westerly side of Fort Point Channel; thence in a rising grade not exceeding one and six-tenths (1.6) feet in one hundred (100) feet with the necessary curves for connecting the same to the grade of said new street as hereinabove established.

Grade of Second Approach.

The grade of the second approach above described begins at the westerly side line of A Street at a point sixteen (16) feet above the city base, and runs generally with a grade of one and seven-

tenths (1.7) feet per one hundred (100) feet with necessary curves for connecting the same with A Street and the new street to the grade of the new street as above established.

Grade of Third Approach.

The grade of the third approach above described begins at the grade of said new street as hereinabove established at its junction therewith, and thence runs by a descending grade not exceeding one and one-half ($1\frac{1}{2}$) feet per one hundred (100) feet to the line of Fargo Street (so called); thence by a descending grade not exceeding one and seven-tenths (1.7) feet per one hundred (100) feet to an elevation of sixteen (16) feet above the city base at the line of C street (so called); thence in said elevation to Congress Street; with the necessary curves for connecting the same to the grade of said new street, as hereinabove established.

In General.

The location and grades of said new street and approaches are shown on six (6) plans thereof, herewith filed as a part of this report, verified by the signatures of the commissioners, and dated March 2, A.D. 1897.

Construction of New Street.

Said new street and approaches connected therewith, as above provided, shall be constructed at the grades above specified in the following manner: —

First. — That portion thereof over Fort Point Channel shall consist of a bridge of four deck spans of iron or steel plate girders resting on masonry piers and abutments, and two retractile draws spanning a clear channel-way of fifty (50) feet.

The masonry abutments and piers are to be built of granite laid solid in cement, and to rest on foundations of piles and concrete.

The foundations of the piers shall be so constructed that the channel through the draw opening may be dredged to the depth of twenty-three (23) feet below mean low water without endangering the stability of any portion of the bridge.

The fixed portions of the bridge are to have paved roadways seventy-six feet wide between curb lines, and two sidewalks each twelve (12) feet wide, the walks to have an asphalt wearing surface and to be protected by iron railings on their outer edges.

Each draw is to be of about half the width of the street, and to be entirely independent of the other.

The main girders and floor beams are to be of iron or steel, the

floor joists of hard pine timber and the flooring to be of two courses of plank.

The draws are to be carried by trucks running on rails which will rest on steel beams or timber stringers, and they in turn to be supported by piles.

The motive power for the draws is to be electricity, but provision is to be made for hand or horse power to be used in an emergency.

Suitable fenders and draw piers are to be provided and connected with the present pier of Congress Street bridge.

Second. — That portion thereof between Fort Point Channel and A Street shall be constructed as follows: —

An abutment shall be built on the line of Fort Point Channel with return walls with suitable filling for a distance of about twenty-five (25) feet on both sides of the street, and for the remainder of the distance to A Street the new street shall be suitably filled within timber bulkheads.

The roadway of this section shall be seventy-six (76) feet wide, and paved and curbed with granite, and have a sidewalk on each side twelve (12) feet wide with plank surface.

Third. — That portion thereof over A Street shall consist of a bridge to span the full width of that street, and be similar in construction to the spans of the bridge over Fort Point Channel, and rest on masonry abutments with foundations of piles and concrete.

Fourth. — That portion thereof between A Street and the land of the New England Railroad Company shall be filled solid with suitable filling supported by timber bulkheads, with a roadway seventy-six (76) feet wide, paved and curbed with granite, with a sidewalk on each side twelve (12) feet wide, with a plank surface.

Fifth. — That portion thereof over the land and railroad of the New England Railroad Company shall consist of a bridge with four spans, the first of which on the west shall be about one hundred (100) feet, and the others about two hundred (200) feet, supported on stone abutments at either end of the bridge, and on rolled steel riveted columns, bolted to stone or concrete piers supported on piles. The abutment at B Street shall be provided with two openings about ten feet wide from about grade sixteen (16) to grade twenty-six (26), for access to the New England Railroad land from B Street.

The bridge superstructure shall be of steel, and each span shall have two side trusses with centres placed about ten (10) feet inside from each street line, and one or two middle trusses with overhead bracings so arranged as to give not less than seventeen (17) feet clear headway over the roadway for teams.

The floor of the bridge shall be of steel floor beams and stringers of either steel or wood, covered with plank treated with some preservative process, with a roadway seventy-six (76) feet wide, less necessary allowance for trusses, paved with granite and curbed with stone or iron, and an asphalt sidewalk twelve (12) feet wide on each side.

The trusses, floor posts and foundations shall be of sufficient strength to support a live load equal to one hundred pounds per square foot, or an alternative load of twenty tons on a space five feet by twelve feet, the twelve feet to be measured parallel with the trusses of the bridge, and the bridge shall be of such height as to give a clear way underneath up to elevation 35.25, and the curb grade not to exceed elevation 40.5 feet each from the city base.

Sixth. — That portion thereof over B Street shall consist of a bridge with a clear span of eighty (80) feet and a clear headroom of nineteen (19) feet above the street at its present grade. This bridge shall rest on masonry abutments, the easterly abutment to be similar to those at A Street.

The superstructure of the bridge shall consist of through plate girders with overhanging sidewalks. The roadway shall be seventy-six (76) feet wide, with necessary allowance for trusses, paved with granite and curbed with granite or iron, with an asphalt sidewalk twelve (12) feet wide on each side.

Seventh. — That portion thereof between B and C streets shall have abutments with return walls of sufficient length to prevent the filling from sloping into those streets, and shall be filled solid with suitable filling; and on the southerly street line the portion abutting on the property of Thomas Cunningham shall have a timber bulkhead to retain the filling, and on that portion abutting on the land of the Commonwealth the filling shall have a side slope of one and one-half to one; and on the northerly street line for the entire distance between B and C streets the filling shall be supported by a bulkhead of timber or by a wall of masonry.

This portion shall have a roadway of seventy-six (76) feet wide, paved with granite and curbed with granite or iron, and a sidewalk twelve (12) feet wide on each side, with a wearing surface of crushed stone or plank.

Eighth. — That portion thereof over C Street shall consist of a bridge with two deck spans supported at the centre of the street by steel columns resting on a masonry pier, carried to a height of three feet above C Street grade, and shall have a pile and concrete foundation. The abutments of this bridge shall be similar to those at A Street, and the bridge shall have a paved roadway seventy-six (76) feet wide and granite or iron curbs, and an

asphalt sidewalk twelve (12) feet wide on each side, and shall have a clear headroom on the street below of not less than sixteen and a half (16½) feet.

Ninth. — That portion thereof between C Street and L Street bridge shall have return walls from the abutment on C Street of sufficient length to prevent the filling from sloping onto C Street, and shall be filled from the abutment to L Street Bridge with suitable filling, with side slopes of one and a half to one, excepting that on the southerly line the portion abutting upon the lot leased to George C. Corcoran shall have a timber bulkhead to retain the filling.

This portion shall have a roadway seventy-six (76) feet wide, paved with granite and curbed with granite or iron, and a sidewalk twelve (12) feet wide on each side, with a wearing surface of crushed stone or plank.

Construction of First Approach.

Tenth. — The first approach leading from Atlantic Avenue to said new street shall be filled solid with suitable filling, supported where necessary by a sea-wall, and shall have a roadway paved and curbed with granite sixty (60) feet wide, with a sidewalk on each side ten (10) feet wide paved with brick.

Construction of Second Approach.

Eleventh. — The second approach, leading from A Street to said new street, shall be filled with suitable filling and supported with timber bulkheads for such distance as is necessary for filling exceeding seven (7) feet in height; and the remainder of the distance to A Street shall be filled with suitable filling with side slopes of one and a half to one, and the surface shall be paved and curbed with granite, with a roadway forty (40) feet wide and a sidewalk ten (10) feet wide on each side with plank surface.

Construction of Third Approach.

Twelfth. — The third approach leading from Congress Street to said new street shall be constructed of suitable filling with slopes of one and a half to one, with a roadway paved and curbed with granite, the roadway to be two-thirds the width of said approach, with a sidewalk on each side of said approach one-sixth the width of said approach, the sidewalks to be surfaced with crushed stone.

Under the bridge on the new street hereinbefore described the roadway may be made of the same clear width as on the balance of the street, the sidewalks to be narrowed accordingly.

All sidewalks shall have suitable fences on the street lines.

The material for filling all the slopes shall be clean sand or gravel.

LAND TAKINGS.

To make the alterations above prescribed, it is necessary to take for street purposes the following-described parcels of land, which are hereby taken for said purposes: —

1. A parcel of land supposed to belong to the Boston Terminal Company, being a strip eighty (80) feet wide, bounded easterly by the harbor line on the westerly side of Fort Point Channel, about one hundred and forty-one one-hundredths (100.41 feet); southerly, westerly and northerly by other land supposed to belong to the said Boston Terminal Company, respectively about eighty and thirty-three one-hundredths (80.33) feet, about one hundred and forty-one one-hundredths (100.41) feet, and about eighty and thirty-three one-hundredths (80.33) feet; and containing eight thousand and thirty-three (8,033) square feet, more or less.

2. A parcel of land supposed to belong to the Boston Wharf Company, being a strip of land one hundred (100) feet wide, bounded northerly by other land supposed to belong to said Boston Wharf Company, about six hundred sixty-one and fifty-four one-hundredths (661.54) feet; easterly by the westerly side of A Street, about one hundred and four one-hundredths (100.04) feet; southerly by other land supposed to belong to said Boston Wharf Company, about six hundred sixty-one and eighty-one one-hundredths (661.81) feet; and westerly by the harbor line on the easterly side of Fort Point Channel, about one hundred and three one-hundredths (100.03) feet; and containing sixty-six thousand one hundred sixty-seven (66,167) square feet, more or less.

3. A parcel of land supposed to belong to the Boston Wharf Company, being a strip one hundred (100) feet wide, bounded northerly by other land supposed to belong to said Boston Wharf Company, about three hundred eighty-one and fourteen one-hundredths (381.14) feet; easterly by land supposed to belong to the New England Railroad Company, about one hundred and four one-hundredths (100.04) feet; southerly by other land supposed to belong to said Boston Wharf Company, about three hundred eighty-one and fourteen one-hundredths (381.14) feet; and westerly by the easterly line of A Street, about one hundred and four one-hundredths (100.04) feet; and containing thirty-eight thousand one hundred fourteen (38,114) square feet, more or less.

4. A parcel of land supposed to belong to Thomas Cunningham, bounded northerly by other land supposed to belong to said

Cunningham, about one hundred seventy-nine and ten one-hundredths (179.10) feet; also northerly by the southerly line of Congress Street, about ninety-six and sixty-nine one-hundredths (96.69) feet; easterly by land supposed to belong to the Commonwealth of Massachusetts, about ninety-one and thirty-two one-hundredths (91.32) feet; southerly by other lands of said Cunningham, about two hundred seventy-six and twenty-two one-hundredths (276.22) feet; and westerly by the easterly line of B Street, about one hundred and forty-four one-hundredths (100.44) feet; and containing twenty-seven thousand one hundred eighty-one (27,181) square feet, more or less.

5. A parcel of land supposed to belong to the Commonwealth of Massachusetts, bounded northerly by the southerly line of Congress Street, about two hundred ten and eighty-seven one-hundredths (210.87) feet; easterly by the westerly line of C Street, about seventy-one and forty-three one-hundredths (71.43) feet; southerly by other land of the Commonwealth, about two hundred eleven and eighty-one one-hundredths (211.81) feet; and westerly by land supposed to belong to Thomas Cunningham, about ninety-one and thirty-two one-hundredths (91.32) feet; and containing seventeen thousand one hundred sixty (17,160) square feet, more or less.

6. A parcel of land supposed to belong to the Commonwealth of Massachusetts, bounded northerly by other land supposed to belong to the Commonwealth, about two thousand twenty-four and seventy-one one-hundredths (2,024.71) feet, measured on two lines respectively about five hundred sixty-two and forty-nine one-hundredths (562.49) feet and about fourteen hundred sixty-two and twenty-two one-hundredths (1,462.22) feet; southerly by the sea-wall built on the northerly side of the Reserved Channel, so called, about one hundred forty-eight and fifty-nine one-hundredths (148.59) feet; also southerly by other land supposed to belong to said Commonwealth, about nineteen hundred fourteen and eighty-one one-hundredths (1,914.81) feet, measured on two lines respectively about thirteen hundred forty-seven and sixty one-hundredths (1,347.60) feet and about five hundred sixty-seven and twenty-one one-hundredths (567.21) feet; and westerly by a line parallel to and five (5) feet distant from the easterly line of C Street as defined in the laying out of Congress Street by the street commissioners of the city of Boston, March 14, 1879, and the prolongation of said line about one-hundred and forty-four one-hundredths (100.44) feet; and containing one hundred ninety-six thousand nine hundred seventy-six (196,976) square feet, more or less.

7. A parcel of land supposed to belong to the Boston Real

Estate Trust, being a strip of land twenty (20) feet wide, bounded northerly by other land supposed to belong to the said Boston Real Estate Trust, about four hundred forty-seven and forty-nine one-hundredths (447.49) feet; easterly by land belonging to a person or persons unknown, about twenty and twenty-nine one-hundredths (20.29) feet; southerly by the northerly line of Congress Street, about four hundred fifty-two and forty-five one-hundredths (452.45) feet; and westerly by the easterly line of Atlantic Avenue, about twenty and six one-hundredths (20.06) feet; and containing eight thousand nine hundred ninety-nine (8,999) square feet, more or less.

8. A parcel of land belonging to a person or persons unknown, bounded northerly by land belonging to a person or persons unknown, about one hundred thirty-one and seventy-two one-hundredths (131.72) feet; easterly by the harbor line on the westerly side of Fort Point Channel, about thirteen and thirty-three one-hundredths (13 33) feet; southerly by the northerly line of Congress Street, about one hundred thirty-five and seventy-three one-hundredths (135.73) feet; and westerly by land supposed to belong to the Boston Real Estate Trust, about twenty and twenty-nine one-hundredths (20.29) feet; and containing two thousand six hundred eight (2,608) square feet, more or less.

9. A parcel of land supposed to belong to the Boston Real Estate Trust, bounded northerly by the southerly line of Congress Street, about forty and fifty-six one-hundredths (40.56) feet; easterly by land supposed to belong to the Boston Electric Light Company, about eighty-four and two one-hundredths (84 02) feet; and westerly by other land supposed to belong to the said Boston Real Estate Trust, about ninety-three and forty-three one-hundredths (93.43) feet; and containing seventeen hundred four (1,704) square feet, more or less.

10. A parcel of land supposed to belong to the Boston Electric Light Company, bounded northerly by the southerly line of Congress Street, about forty-six and thirty one-hundredths (46.30) feet; measured on four lines, respectively three and thirty-eight one-hundredths (3.38) feet, twenty and eighty one-hundredths (20.80) feet, one and eighty one-hundredths (1.80) feet and twenty and thirty-two one-hundredths (20.32) feet; easterly by the harbor line on the westerly side of Fort Point Channel, about two hundred ninety-five and eighty-nine one-hundredths (295.89) feet; southerly by land supposed to belong to the Boston Terminal Company, about eighty and ninety-eight one-hundredths (80.98) feet; and westerly by other land supposed to belong to said Boston Electric Light Company, about two hundred thirteen and twenty-

nine one-hundredths (213.29) feet; and by land supposed to belong to the Boston Real Estate Trust, about eighty-four and two one-hundredths (84.02) feet; and containing twenty-two thousand fifty-three (22,053) square feet, more or less.

11. A parcel of land supposed to belong to the Boston Terminal Company, bounded northerly by land supposed to belong to the Boston Electric Light Company, about eighty and ninety-eight one-hundredths (80.98) feet; and southerly and westerly by other lands supposed to belong to the Boston Terminal Company, respectively about eighty and thirty-three one-hundredths (80.33) feet and about five and thirty-three one-hundredths (5.33) feet; and containing two hundred thirteen (213) square feet, more or less.

12. A parcel of land supposed to belong to the New England Railroad Company, bounded easterly by the westerly line of A Street, about thirty-three and seventy-three one-hundredths (33.73) feet; south-westerly by land supposed to be a part of the location of said New England Railroad, about one hundred sixty-six and eighty-three one-hundredths (166.83) feet, measured on the arc of a circle of twelve hundred eighty-six and fifty-seven one-hundredths (1,286.57) feet radius; and northerly by other land supposed to belong to said New England Railroad Company, one hundred fifty-five and ninety-seven one-hundredths (155.97) feet; and containing twenty-two hundred sixty-seven (2,267) square feet, more or less.

13. A parcel of land supposed to be a part of the location of the New England Railroad, bounded easterly by the westerly line of A Street, about twenty-seven and seventy-nine one-hundredths (27.79) feet; southerly by land supposed to belong to the said New England Railroad Company, about five and fifty-eight one-hundredths (5.58) feet; south-westerly by other land supposed to belong to said New England Railroad Company, about six hundred and twenty one-hundredths (600.20) feet, measured on two lines, respectively about five hundred eleven and sixty-nine one-hundredths (511.69) feet, on the arc of a circle of twelve hundred sixty and fifty-seven one-hundredths (1,260.57) feet radius, and eighty-eight and fifty-one one-hundredths (88.51) feet; westerly by other land supposed to be part of the location of said New England Railroad, thirty-three and sixty-one one-hundredths (33.61) feet, measured on the arc of a circle of one hundred twenty (120) feet radius; and northerly by land supposed to belong to the Boston Wharf Company, about one hundred twelve and ninety-six one hundredths (112.96) feet, measured on two lines respectively one hundred nine and sixty-four one-hundredths

(109.64) feet and three and thirty-two one-hundredths (3.32) feet, on the arc of a circle of twelve hundred eighty-six and fifty-seven one-hundredths (1,286.57) feet radius; also northerly by other land within the location of said railroad, about three hundred forty-three and thirty-one one-hundredths (343.31) feet; and north-easterly by land of the last-described parcel, about one hundred sixty-six and eighty-three one-hundredths (166.83) feet, measured on the arc of a circle of twelve hundred eighty-six and fifty-seven one-hundredths (1,286.57) feet radius; and containing thirteen thousand three hundred eighty-one (13,381) square feet, more or less.

14. A parcel of land supposed to belong to the New England Railroad Company, bounded south-westerly by land supposed to belong to the Boston Wharf Company, about four hundred thirty-two and sixty-five one hundredths (432.65) feet, measured on two lines, respectively three hundred eighty-eight and sixteen one-hundredths (388.16) feet, on the arc of a circle of twelve hundred thirty-four and fifty-seven one-hundredths (1234.57) feet radius, and forty-four and forty-nine one-hundredths (44.49) feet; westerly by other lands supposed to belong to said New England Railroad Company, about fifty-one and fifty-one one-hundredths (51.51) feet, measured on the arc of a circle of one hundred twenty (120) feet radius; northerly and north-easterly by land of the last-described parcel six hundred and twenty one-hundredths (600.20) feet, measured on two lines, respectively eighty-eight and fifty-one one-hundredths (88.51) feet and five hundred eleven and sixty-nine one-hundredths (511.69) feet, on the arc of a circle of twelve hundred sixty and fifty-seven one-hundredths (1,260.57) feet radius; and southerly by other land of said New England Railroad Company, one hundred seventeen and four one-hundredths (117.04) feet; and containing thirteen thousand six hundred twenty-one (13,621) square feet, more or less.

15. A parcel of land supposed to belong to the Boston Wharf Company, bounded northerly and north-easterly by the last-described parcel of land, about four hundred thirty-two and sixty-five one-hundredths (432.65) feet, measured on two lines, respectively forty-four and forty-nine one-hundredths (44.49) feet and three hundred eighty-eight and sixteen one-hundredths (388.16) feet, on the arc of a circle of twelve hundred thirty-four and fifty-seven one-hundredths (1,234.57) feet radius; and southerly by other land supposed to belong to said Boston Wharf Company, about four hundred thirty and sixty-nine one-hundredths (430.69) feet, measured on two lines, respectively about four hundred eight and seventy-eight one hundredths (408.78) feet and about twenty-

one and ninety-one one-hundredths (21.91) feet, on the arc of a circle of one hundred twenty (120) feet radius; and containing fifty-six hundred ninety (5,690) square feet, more or less.

16. A parcel of land supposed to belong to the Boston Wharf Company, bounded northerly by the southerly line of said new street, about seventy-four and ninety-five one-hundredths (74.95) feet; northerly by other land supposed to belong to said Boston Wharf Company, about one hundred two and twenty-three one-hundredths (102.23) feet, measured on two lines, respectively about eighty-three and seventy-two one-hundredths (83.72) feet, on the arc of a circle of sixty (60) feet radius, and about eighteen and fifty-one one-hundredths (18.51) feet; southerly by land supposed to be part of the location of the New England Railroad, one hundred and twelve and ninety-six one-hundredths (112.96) feet, measured on two lines, respectively three and thirty-two one-hundredths (3.32) feet, on the arc of a circle of twelve hundred eighty-six and fifty-seven one-hundredths (1,286.57) feet radius and one hundred nine and sixty-four one-hundredths (109.64) feet; and westerly by other land supposed to belong to said Boston Wharf Company, sixty-three and eighty-seven one-hundredths (63.87) feet, measured on two lines, respectively two and fourteen one-hundredths (2.14) feet, on the arc of a circle of one hundred twenty (120) feet radius, and sixty-one and seventy-three one-hundredths (61.73) feet; and containing four thousand three hundred six (4,306) square feet, more or less.

17. A parcel of land supposed to belong to the Commonwealth of Massachusetts, being a strip of land eighty (80) feet wide, bounded northerly by the southerly line of said new street as hereinbefore described, about eighty and thirty-five one-hundredths (80.35) feet; and easterly, southerly and westerly by other lands supposed to belong to said Commonwealth, respectively about three hundred twenty-two and sixty-seven one-hundredths (322.67) feet, eighty (80) feet and about three hundred fifteen and thirteen one-hundredths (315.13) feet; and containing twenty-five thousand five hundred twelve (25,512) square feet, more or less.

18. A parcel of land supposed to belong to said Commonwealth, being a rectangular strip of land fifty (50) feet wide, bounded easterly by the last-described parcel fifty (50) feet; and southerly, westerly and northerly by other land supposed to belong to said Commonwealth, respectively about four hundred eighty (480) feet, fifty (50) feet and about four hundred eighty (480) feet; and containing twenty-four thousand (24,000) square feet, more or less.

19. A parcel of land supposed to belong to said Commonwealth, being a rectangular strip sixty (60) feet wide, bounded easterly by

the last-described parcel fifty (50) feet and by other lands of th Commonwealth about two hundred eighty-five and sixty-two one hundredths (285.62) feet; northerly by the southerly line of Con gress Street and the prolongation of said line sixty (60) feet westerly and southerly by other lands of the Commonwealth respectively about three hundred thirty-five and sixty-two one hundredths (335.62) feet and sixty (60) feet; and containing twenty thousand one hundred thirty-seven (20,137) square feet more or less.

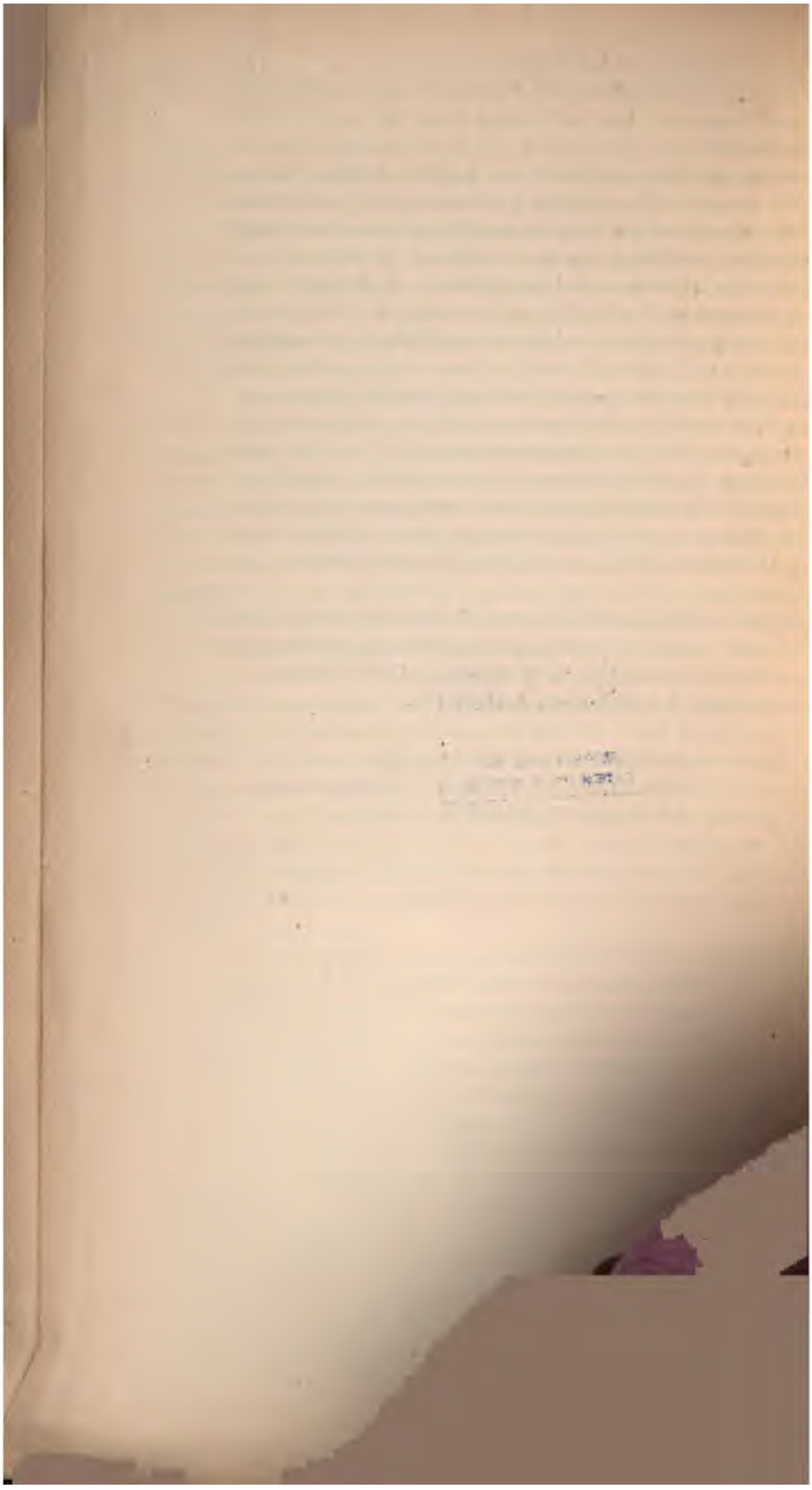
20. A parcel of land supposed to belong to the said Commo wealth, being a rectangular strip of land five (5) feet wide an seventy-five (75) feet long, bounded northerly by the prolongatio of the northerly line of Congress Street as now laid out five (5) fee southerly by the prolongation of the southerly line of said stre five (5) feet; westerly by the easterly line of C Street as defined the laying out of said Congress Street seventy-five (75) feet; a easterly by a line parallel to and five (5) feet from the last d scribed line seventy-five (75) feet; and containing three hundre seventy-five (375) square feet, more or less.

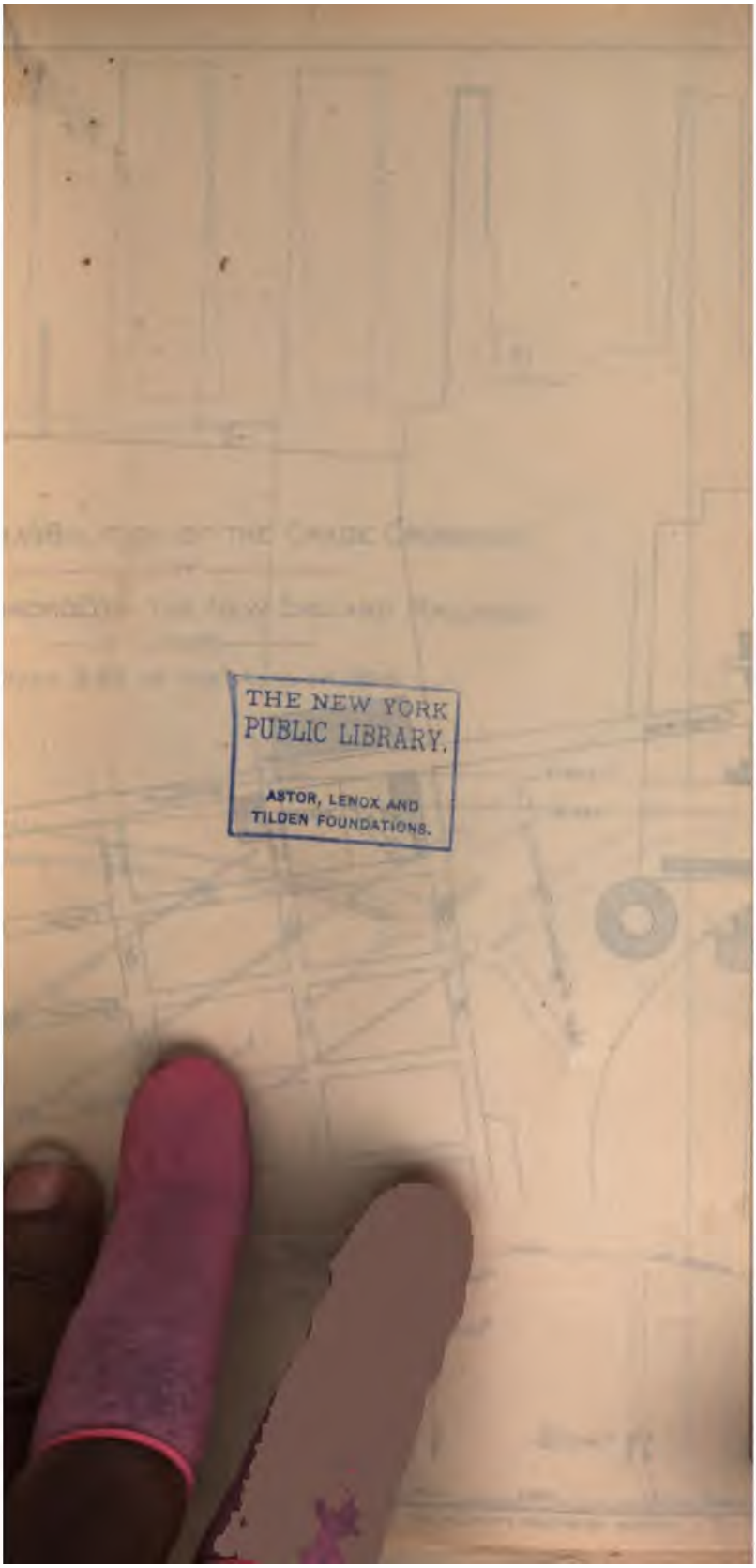
21. A parcel of land supposed to be within the location o Congress Street as now laid out, being a rectangular strip of land fifty-five (55) feet wide and seventy-five (75) feet long, bounde northerly by lands supposed to belong to the Commonwealth o Massachusetts, fifty-five (55) feet; easterly and southerly by othe parcels of land hereinbefore described, respectively seventy-fiv (75) feet and fifty-five (55) feet; and westerly by other lan within the location of Congress Street seventy-five (75) feet; an containing forty-one hundred twenty-five (4,125) square feet, mor or less.

22. For the purpose of maintaining the bridge over the lan and tracks of the New England Railroad Company above described and so far as it is required for that purpose, it is necessary to tak the following-described parcel of land supposed to belong to th New England Railroad Company, being a strip of land one hun dred (100) feet wide, bounded northerly by other lands supposed t belong to the said railroad company, about seven hundred fourtee and seven one-hundredths (714.07) feet; easterly by the westerl side line of B Street about one hundred one and thirty-six one hundredths (101.36) feet; southerly by other lands supposed t belong to the said railroad company, about six hundred ninety four and sixty-three one-hundredths (694.63) feet; and westerl by lands supposed to belong to the Boston Wharf Company, abou one hundred and four one-hundredths (100.04) feet; and co taining seventy thousand four hundred thirty-five (70,435) squa *feet, more* or less.

l of said parcels of land are shown upon the plans herein-
e mentioned.
ie hearing was then continued and adjourned from time to
, for the purpose of hearing the parties upon the proportions
hich the expenses of the alterations and improvements herein-
re prescribed, including damages occasioned by the taking of
and by the alteration and construction of highways and
ges, as required by this report, and including the cost of the
ing and the compensation of the commissioners and auditors
their services and expenses, shall be borne by the parties; and
, having fully heard the parties, their evidence and arguments,
d having fully considered the same, and all the relations of the
rties, we decide that the Commonwealth shall pay thirty-one
r cent. thereof, the city of Boston thirty per cent. thereof, and
e New England Railroad Company thirty-nine per cent. thereof.
We decide that the work required by this report shall be done
the city of Boston and the New England Railroad Company, as
llows: —
The New England Railroad Company is to build the bridge over
e land of said company, including the abutments, and the city
Boston shall do all the other work required by this decision.
Dated this second day of March, A.D. 1897.

GEORGE W. WIGGIN,
CHARLES A. ALLEN,
EDWARD B. BISHOP,
Commissioners.

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ANNUAL REPORT

OF THE

BOARD OF HARBOR AND LAND COMMISSIONERS

FOR THE YEAR 1898.

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REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1898, covering a period of twelve months, from Nov. 30, 1897.

From Dec. 1, 1897, to Nov. 30, 1898, the Board has held 213 meetings, has given 282 formal and informal hearings, and has received 172 petitions for license to build and maintain structures and for privileges in tide waters, great ponds and the Connecticut River, to dredge material, to remove material from beaches, and for other purposes.

One hundred and seventeen licenses for structures and privileges in tide waters, great ponds and the Connecticut River have been granted during the year; also 37 permits for dredging, for the removal of material from beaches, and for other purposes.

On Dec. 9, 1897, the Board met with the State Board of Health, acting as a joint board, under chapter 495 of the Acts of 1896 and chapter 98 of the Resolves of 1897, and heard counsel in the matter of the restoration of Green harbor in Marshfield.

On July 8, 1898, a hearing was given in Turner's Falls, on the petition of the Turner's Falls Lumber Company for license to hang and maintain booms in the Connecticut River in the towns of Gill and Montague, under chapter 498 of the Acts of 1898.

On Nov. 3, 1898, a hearing was given in New Bedford, on the petition of a joint special committee of the city council of New Bedford, for the revision and re-establishment of harbor lines in New Bedford harbor. All other hearings were given by the Board at its office in Boston.

April 14, 1898, the Board refused to grant a permit to the Eastern Dredging Company to dredge in Shirley Gut, for fear of disturbing the metropolitan sewer and the water pipe connection with Deer Island.

May 31, 1898, the Board refused to grant a permit to the Bay State Dredging Company to dump dredged material in Mystic River near the shore line, as it could not be done at the place desired consistently with the public interest.

June 15, 1898, Frank Rutzen, petitioner for license to build a boat landing in Dorchester Bay, at his own request was given leave to withdraw.

June 21, 1898, the Board refused to grant a permit to Chas. E. Davis to dump dredged material in New Bedford harbor, owing to objections on the part of shore resident near the desired locality.

Aug. 3, 1898, John Burns, petitioner for license to drive piles and construct blocks for repairing scows in Boston harbor at East Boston, at his own request was given leave to withdraw.

Aug. 9, 1898, E. E. Tilden, petitioner for authority to remove stones from the beach at Point Allerton in Hull, was given leave to withdraw, on the ground that such removal would tend to weaken the beach.

Oct. 5, 1898, Joseph Hellen, petitioner for license to drive piles in Mystic River in Medford, was given leave to withdraw, as the work proposed would be outside the United States harbor line.

The Board has inspected from time to time the work done under appropriations made by the Commonwealth, on the South Boston flats, the Province Lands in Provincetown, and at Osterville, Menamsha Inlet, Scorton harbor and Green Harbor; also the sites of proposed work in tide water, great ponds and the Connecticut River, covered by petitions and plans filed with the Board.

Southern Union Passenger Station.

The location and construction of the Southern Union Passenger Station on Summer Street, adjacent to Fort Point Channel, has transformed the section of the city in which it is established.

The station itself covers an area a little larger than the Commonwealth pier, and occupies the place of many wharves and docks. It is the largest station in the country, and is possessed of many new and ingenious arrangements for the convenience and accommodation of its patrons. While it drove away many business concerns from the location to be occupied, it enhanced the value of the neighboring property. It has thus influenced the removal of business to points where land was less valuable, and has created a fresh demand for land on the east side of the channel and along the borders of South Bay. It may also be said to have forced attention to the Commonwealth's flats beyond the freight yard of the New England Railroad Company, where the investing public will find land suitable for manufacturing industries and large warehouses, for which this territory is peculiarly well adapted.

South Boston Flats.

In the autumn of 1897 it was found that the interests of navigation required that the channel continued from the Reserved Channel at L Street bridge to the deep water should be widened. Consequently, a contract* was made with the New England Dredging Company, dated Dec. 24, 1897, for that purpose for the sum of $7,850. The existing channel was broadened to a width of 200 feet, with a depth of 12 feet at mean low water. The work was accomplished to the satisfaction of the Board within the time limited in the contract.

The bulkheads and other structures at the flats are generally in good condition. Slight repairs, however, have been made to the planking of the bulkhead on the north-east corner, where the sea-worms (*Limnoria Terebrans*) had eaten away the planking, so that more or less filling was washed out from behind the bulkhead.

* See Appendix A.

During the storm of November 27, six vessels were driven ashore, breaking a number of piles and otherwise weakening the bulkhead in two places, so as to require some slight repairs. The extreme tide and heavy sea of that storm washed out a foot or more of the filling immediately in the rear of the bulkhead on the northerly side of the filled flats, without, however, doing any material damage.

The sewers have maintained their condition satisfactorily, though some of the catch-basins where the planking had become decayed ought to be repaired. Additional sewers will be required in some of the streets during the coming year.

The streets have received but little attention during the past year, though some of them have had severe usage, owing to a great increase of traffic. The building of freight houses by the New England Railroad Company close up to the westerly side line of B Street, for the receipt and delivery of freight, has resulted in appropriating a 30-foot strip in the street to the purpose of freight receipts and deliveries. The necessarily attendant increase of traffic has cut up the surface so as to make paving indispensable. For this purpose the co-operation of the city of Boston with the Commonwealth is essential. In July last the Board held a conference with the mayor and the representatives of the street department, with a view to laying out B Street 80 feet wide, and paving it suitably for the use and traffic it was destined to receive. Progress has been made in this direction, and it is anticipated that another year will see it completed.

The discontinuance of Congress Street, while the extension of Summer Street is building on a portion of its location, made a new way to accommodate the passage of traffic unavoidable, and arrangements have been made with the city of Boston to unite with the Commonwealth in completing Fargo and E streets, with the result that when Summer Street extension is finished there will be two completed thoroughfares in an east and west direction across the Commonwealth's property. These contemplated improvements are greatly needed, and have been urgently demanded by that portion of the public whose business requires their use.

The extension of Summer Street through the Commonwealth's property, under the decree of the Superior Court dated March 13, 1897, embodying the findings of the commissioners appointed to "prescribe the manner in which the grade crossing of Congress Street and the railroad of the New York & New England Railroad Company (now the New England Railroad Company) shall be abolished," in accordance with the provisions of Statutes of 1896, chapter 535, is progressing slowly.

The piers for sustaining the bridge across Fort Point Channel are nearly finished, as are also the abutments provided for the street crossings beyond. The work of filling the avenue has been commenced. The construction of the bridge and avenue is under the control and direction of the engineering department of the city of Boston, whose expectation it is that the avenue will be open for traffic within the coming year.

Approaches or ramps will have to be built from the level of the present streets at grade 16 to reach the elevation of the new avenue. These are provided for under the decree of court.

In locating Summer Street, nearly one-third of the lot occupied by George C. Corcoran under lease and contract of sale from the Commonwealth was cut off. As he desired more room for his business, and the Board desired to have him move from that location, a satisfactory arrangement was made whereby he released his interest in his said lot, and arranged for the lease and purchase of a lot on the easterly side of D Street, between Anchor and Bullock streets. An arrangement was effected with the city for supplying the lot with proper sewer connections.

In laying out and locating Summer Street extension, a portion of the Commonwealth's land was taken, for which indemnity is provided in the statute authorizing the taking. All necessary plans and information have been filed in the office of the Attorney-General and proceedings for indemnity are now pending in court.

The Commonwealth Pier.

The core or solid portion of this pier is under contract, as stated, in the last annual report, 300 feet wide and 1,150 feet long. The outer walls of the pier are to be of granite blocks, resting on a foundation of piles driven to extreme low-water mark, and the material for filling between these sea walls is now being excavated and deposited from the adjacent docks.

This structure, built in accordance with carefully prepared plans, under the supervision of the Board, with the experience already gained from building the piers now occupied by the New England Railroad Company, is calculated to withstand the tests of time. Specifications are now under preparation for a 50-foot pile and timber platform to surround this solid core, embodying all the improvements as to form of construction and material that the latest experiences and studies here and elsewhere can suggest. When completed, this magnificent pier will be 400 feet wide and 1,200 feet long, containing an area of about 11 acres with docks adjacent 30 feet deep at mean low water. The structure is such that docks can be excavated to a depth of 35 or 40 feet at low water, if desired, without fear of undermining.

When the foregoing work is finished, it will be necessary to erect such buildings on the surface as the nature of the business to be transacted there may need for its accommodation. This will depend somewhat upon the character and requirements of the lessees. Suitable railroad tracks, laid upon the pier and located so as to make it a terminal connecting with the different railroad systems entering Boston, will become necessary.

To secure the great advantages this pier is capable of affording to the commercial interests of the community, it is indispensable that it should have ready and easy access to the business heart of the city. The Board has had assurances that justify it in stating that a contract for a satisfactory lease covering a period of fifteen years could have been executed had the Board been in a position to promise such access as the requirements of business there will make necessary, and such as has been in contemplation by the

Commonwealth and the city of Boston ever since the first project for developing this territory was promulgated, more than a quarter of a century ago.

Northern Avenue.

It cannot be too frequently or forcibly brought to the attention of the Legislature that a large and valuable tract of land belonging to the Commonwealth, covering an area of 170 acres and estimated to be worth in the neighborhood of $3,000,000, within 2,000 feet of Atlantic Avenue, is cut off from communication with the heart of the city by an insurmountable barrier in the length of over three-fifths of a mile now crossed by a single avenue, and that is Summer Street extension, elevated over the tracks of the New England Railroad Company. Owing to this condition of affairs, another avenue of communication, already projected, becomes absolutely essential, not only for the proper development of the Commonwealth's property, but for the purpose of accommodating the traffic ready to seek an entrance thereto so soon as facilities shall be provided.

Northern Avenue was projected in the plan for the occupation of flats owned by the Commonwealth in Boston harbor, approved and adopted by the General Court by chapter 81 of the Resolves of 1866, and modified according to chapter 354 of the Acts of 1867, and chapter 326 of the Acts of 1868. This is fully set forth in the sixth annual report of the Board of Harbor Commissioners, dated Jan. 15, 1872 (H. Doc. No. 56, 1872), over the signatures of those able and astute guardians of the Commonwealth's interests, Hon. Josiah Quincy, Hon. Darwin E. Ware, Hon. F. W. Lincoln, J. N. Marshall, Esq., and W. T. Grammer, Esq., who then constituted the Board of Harbor Commissioners.

Subsequently, the Commonwealth, the Boston & Albany Railroad Company (then holding a portion of the present terminals of the New England Railroad Company), the Boston Wharf Company, and the city of Boston, in a four-part agreement dated June 24, 1873, undertook the development of a portion of the flats which have since become the valuable property lying between Fort Point Channel, the Reserved Channel, First Street, and the harbor front.

Under the four-part agreement of 1873 great benefits were expected to ensue to all the parties thereto.

At present the city has added to her territory 170 acres of land filled to grade 13, with streets gravelled to grade 16, and has secured the right, without incurring land damages, to lay out and construct the streets and sewer the same, in readiness for sale and improvement, whereby a large increase of taxable property will surely become assessable for the benefit of her treasury.

During the period since 1873 the Boston Wharf Company has increased the value of its property more than five-fold; and the railroad interest has not only received all contemplated benefits and even more, but has so intrenched itself in its possessions as almost to defy the right of the city and the Commonwealth to have Northern Avenue cross its grounds.

The Commonwealth seems to be the only party to that agreement to whom the contemplated benefits have failed to materialize.

The agreement provides, among other things, that the city will, within twelve months after the request of the Board of Harbor Commissioners, approved by the Governor and Council, build Northern Avenue bridge, at a cost not to exceed a fixed sum.

The city agrees that, in case it shall fail to build the bridge and extend Northern Avenue, the Commonwealth may build said bridge and extend said avenue; and that the city will pay all reasonable expenses, not exceeding the limit fixed, which the Commonwealth shall incur in building the bridge and avenue.

Further, the Commonwealth and the railroad company agree that the city may lay out Northern Avenue not more than 100 feet wide across the railroad land and tracks, without liability for land damages.

Still further, it is agreed that the city shall be subjected to no grade or other damages for any land taken or any injury done to land of either of the parties, the Commonwealth, the railroad company or the wharf company, on the south-east side of Fort Point Channel, in performing its obligations under the indenture.

The conditions precedent to the right of the Commonwealth to call on the city to fulfil its part of the contract to lay out Northern Avenue and build a bridge have been complied with.

In March, 1898, the city was served by the Board of Harbor and Land Commissioners with the prescribed request, approved by the Governor and Council, to build Northern Avenue bridge. The Board is not aware that any action in response to its request has been taken by the city.

"The awful shadow of some unseen Power" has hitherto persistently prevented the building of Northern Avenue and Northern Avenue bridge; but the time has now come for the public to receive the benefit of these projected improvements, and for that purpose some further legislation will be required, unless the supreme advantages both to the Commonwealth and the city of Boston contemplated by the development of the Commonwealth's flats water front are to be abandoned.

Fort Point Channel.

Under licenses from the Board during the past year, a handsome and substantial sea wall has been built on the west harbor line of Fort Point Channel, on which Dorchester Avenue as newly laid out now borders, between Summer Street and Federal Street bridge.

The construction of the abutments and piers of Summer Street bridge is progressing.

The old New England Railroad bridge has been removed from the channel and there is no further hindrance to carrying forward the project of the Federal government for deepening the channel for vessels.

Plans of the Boston & Providence Railroad Corporation and of the Old Colony Railroad Company for new bridges over Fort Point Channel were approved, after making satisfactory provisions for draws, in view of the increased size of vessels and barges using this channel into South Bay.

The following extract from the report of Colonel Mansfield to the Chief of Engineers, for the fiscal year ending June 30, 1898, and by him endorsed and transmitted by the Secretary of War to Congress, relates to the project for improving the channel: —

This channel is situated between the eastern shore of Bos proper on the one side and the reclaimed and improved flats South Boston on the other side. It connects the tidal basin South Bay, which has an area of 250 acres, with Boston in harbor, is fast becoming the centre of the city's most extensi shipping trade, and is the most important branch of the main sh channel. Fort Point Channel is 1¼ miles long.

Before improvement, the least depth at mean low water was 1 feet at its entrance and 17 feet above Congress Street bridge.

That part of it which it is proposed to improve is spanned b bridges at Congress street, Mount Washington Avenue, and at a intermediate point. The bridges have conveniently located dra openings; but the draw piers of the railroad bridge must b strengthened or reconstructed before the improvement can be ex tended past them, and the width of the draw increased to that o the other bridges above and below it.

The project for this improvement was submitted Jan. 27, 1885 It proposed the excavation of a channel 175 feet wide and 23 fee deep at mean low water, from the entrance to near Federal Stree bridge, a distance of 4,100 feet, and was estimated to cost $100,000 the railroad bridge to be reconstructed at the expense of the owners

By the act of Aug. 5, 1886, $18,750 was allotted for the im provement of this channel from the appropriation for Boston harbor.

The total expenditures to June 30, 1897, were $18,750.

No operations were in progress during the year, and the condition of the improvement June 30, 1898, is as follows: The channel is dredged as proposed from its entrance to Congress Street bridge, a distance of 1,900 feet; 94,211 cubic yards were removed in effecting this improvement during the year 1887.

To complete the improvement, as proposed, to Federal Street bridge, will cost $60,000; and this sum could be expended to advantage during the fiscal year ending June 30, 1900, if the railroad draw shall have been properly reconstructed.

South Bay.

As early as 1847 harbor lines were established in South Bay, in order to preserve that valuable waterway as a means of cheap transportation for heavy materials nearer to the centre of what even then was foreseen would become a densely populated district. The wisdom of this foresight is appreciated to-day, when we consider the great relief to the congested traffic in our streets afforded by landing

materials of a bulky nature at the wharves in South Bay, instead of carting them through the crowded thoroughfares. Efforts have been made from time to time by private interests to have the bay filled and made into city lots. Fortunately, however, all such efforts have been rendered futile. Meanwhile, the Legislature in various enactments from time to time has established harbor lines around the bay, the latest enactment being chapter 278 of the Acts of 1898. The last act fixed the present lines, and also made provision for excavating material from the bay for the purpose of improving navigation therein and the sanitary condition thereof. Claims existed for displacement of tide water in the bay by the deposition of solid material in its waters under licenses from this Board. A satisfactory settlement was made on the largest claim by the payment by the Roxbury Central Wharf of the sum of $35,937.50 into the treasury of the Commonwealth. Empowered with this sum, the Board made a contract,* dated Oct. 3, 1898, with Simon Hess of New York, to excavate a considerable area in the bay. Before proceedings under this contract were commenced, a bill of complaint against the commissioners and said Hess was filed in the Supreme Judicial Court in the county of Suffolk, asking that the defendants be restrained and enjoined from the proposed improvement of the bay under the terms of the contract, upon the ground of the unconstitutionality of the statute; and the same is now pending, awaiting decision of the court. If the final determination is favorable, it is the intention of the Board ultimately to excavate all the material between the harbor lines in the bay, and thus improve navigation to the adjacent water fronts as they may be built up, and forever remove the existing summer nuisance of exposed flats from that neighborhood, where there are already two large hospitals. If the decision is unfavorable, further legislation will be necessary.

* See Appendix B.

THE EXTENSION OF PUBLIC OWNERSHIP TO THE LAN AND FLATS ON THE EASTERLY SIDE OF EAST BOSTON

Chapter 486 of the Acts of 1897, authorizing the Boa of Harbor and Land Commissioners to purchase or take fee lands and flats on the easterly side of East Bost from an area bounded south-westerly by the south-weste side line of Sumner Street extended, south-easterly by t United States pier-head line, north-easterly by the fl owned by the city of Boston and appurtenant to the W Island Park, north-westerly by a line parallel with and 1,5 feet inside of or shoreward from said pier-head line, and r quiring takings to be made before the first day of July, 189 was approved June 10, 1897. At the time the lands autho ized to be taken were held in separate parcels, many of whic were small, and some had numerous owners. One parc was large, and owned by the East Boston Company, a Ma sachusetts corporation owning a very large extent of territor both upland and flats above and below the shore line at Ea Boston.

The property that the Board decided it was expedient fo the Commonwealth to acquire under the act aforesaid la mostly under water at high tide, being originally flats appu tenant to the uplands. There had been no recent sales similar flats in that neighborhood whereby to assist in fixin their value, so that the determination thereof would natu ally become largely a matter of opinion.

Early in the fall of 1897 negotiations were opened wit the East Boston Company, as the owner of the largest pa cel proposed to be acquired, with a view of ascertaining t valuation that company would put upon the flats sought be purchased. The Board, after several conferences wit representatives of that company, concluded that they woul not be able to agree upon a price, and that some other mea of determining a fair and proper valuation of the land to acquired would have to be sought.

Thereupon the Board proceeded to ascertain, throug various instrumentalities, at what price the smaller parce of land within the area proposed to be acquired could be pu chased, and to obtain options on the same. In this mann

a sufficient number of options were secured, at prices which would justify the conclusion that the property authorized to be taken under the statute could be acquired within the limit of $100,000 therein appropriated.

Having become satisfied in this respect, the Board proceeded to purchase several of the more valuable small lots of flats lying near the improved and occupied end of Jeffries Point, at the rate of 2½ cents a square foot, and, with the approval of the Governor and Council, to take conveyances thereof to the Commonwealth. Thereafterwards the Board proceeded, under and by virtue of the power conferred by the statute, to take the area it was authorized to acquire for the purpose of controlling that section of the water front on Boston harbor. All proceedings have been conducted under the guidance of the Attorney-General, and, unless damages for the takings can be agreed upon, they will have to be determined by a jury in the Superior Court.

The Commonwealth has by this taking * dedicated another section of the harbor front to the use of maritime commerce, and has confirmed the policy of encouraging the growth of this port by taking measures to meet growing demands for enlarged accommodation, while preserving conditions which will operate against increase of cost in supplying facilities for handling cargoes in process of transportation or for local delivery. In order that this acquisition may realize the greatest possible benefit to the public, it will be necessary for the railroads with freight terminals in East Boston to relocate their tracks on the east side of the island, as was advocated in the report of the State Board on Docks and Terminal Facilities in 1896, and by the mayor of Boston in 1897. By so doing, a short, cheap and easy rail connection can be made to the piers and docks to be established on the newly acquired territory by the group of railroads having terminals on the north side of the harbor.

In order that the Board may carry out the further provisions of this statute, additional legislation will be required; and it is respectfully recommended that some action be taken at the present session.

* See Appendix C.

Boston Harbor.

The projected work of the Federal government for improving the harbor is progressing steadily. All rocks and shoals in the main ship channel between Boston Light and President Roads have been removed to a depth of 27 feet at mean low water, for the width of 1,000 feet as far up as Lovell's Island, between which and Gallop's Island the contractors are still at work.

The project for a channel through Broad Sound up to the Navy Yard, 1,200 feet wide and 30 feet deep, has been advocated by the Chief of Engineers of the United States Army. This project may be separated into two parts, of which the Broad Sound Channel is most urgent and least expensive, having been estimated to require less than half a million dollars, or $481,941.57, for its completion. It is expected that the Rivers and Harbors Committee of Congress will include it in appropriations to be recommended at the coming session.

The Federal government has appropriated $1,025,000 for the building of a new graving or dry dock at the Charlestown Navy Yard. A site has been selected along the north side of the present dry dock. Owing to the length of the new dock, it will be necessary to encroach into the harbor beyond the present line of the Navy Yard quay. The impracticability of locating the dock elsewhere, and the unquestionable desirability of the location selected, together with the great public benefit incident to its installation at the Charlestown yard, would seem to more than outweigh objections to the proposed extension of the quay front.

Contemporaneously plans are under discussion for enlarging the dock lying at the westerly end of the Navy Yard to the width of 160 feet, with a length of 570 feet.

The completion of the Commonwealth pier, having railroad connection by floats or tracks on both the north and south sides of the harbor; a large dry dock at the Navy Yard, open to merchant vessels of the largest class, unable to dock elsewhere; a channel 1,200 feet wide and 30 feet deep at mean low water from the head of the harbor to President Roads; and a straightaway course almost from

Long Island Head through Broad Sound Channel to the sea, approachable, by means of suitable beacons, in all weathers, and navigable at any stage of the tide, — will enable the port of Boston to receive and handle the commerce of the future, however large, without raising port or landing charges, and to maintain itself in competition as a port of low rates with any on the Atlantic coast.

The export of domestic products of the entire country now averages over $100,000,000 a month, having nearly doubled in twenty years. We are thus the largest exporting nation in the world, having surpassed England during the past year by about $60,000,000.

The proportion of manufactured goods to the entire exports has largely increased, being for the year 1898 nearly one-fourth. The size, capacity and speed of the steamships carrying these products have been greatly augmented. The requirements for greater depth and breadth, as well as for the straightening of the channels or waterways to the sea, have consequently become imperative.

Boston should gain her fair share of this great increase in exports, and she can do it only by increasing her facilities and accommodations. In order to accomplish this, she must call on the Federal government for harbor improvement, through her Representatives and Senators in Congress, until her requirements are satisfied.

Charles River.

The changes and improvements which have been carried out in Charles River during the past year are quite extensive.

In the construction of the new bridge from Boston to Charlestown, between the Warren and Charles River bridges, the granite piers for the fixed spans have been completed, and the spans, which are of steel, have been placed upon them.

Under chapter 467 of the Acts of 1898, the cities of Boston and Cambridge were authorized and required to build a new bridge in place of the present West Boston bridge over Charles River, from the foot of Cambridge Street in Boston to Main Street in Cambridge.

On the Cambridge shore, between West Boston bridge and the Charles River Embankment Company, a handsome granite sea wall has been built on the harbor line, and the flats inside filled solid to the upland. An esplanade 200 feet wide is reserved, beyond which it is expected a residential district in time will extend back to the railroad.

In doing this work under licenses from the Board to the city of Cambridge and other owners of the flats, substantially all the mud and soft material in the flats on the northerly side of the channel between the two bridges have been excavated to a depth of from 5 to 20 feet. There remains, however, in the river north of the channel a large bank of gravel, which in some places is covered by a slight depth of soft material. Quite a large area of this projects above the level of extreme low water; and, inasmuch as the gravel has a considerable market value, it was not deemed best to require that it be used for filling the adjacent flats, but to permit it to remain for the present, with the expectation that it will be wholly removed to a depth of at least 6 feet below low water within a few years, in the natural course of business. In time we hope to see all the mud flats in this basin displaced.

Above Harvard bridge no material change has been made before coming to the improvement being carried out by the city of Cambridge and the Metropolitan Park Commission above Western Avenue bridge.

The work on the Cambridge side of the river from Western Avenue to the Cambridge Hospital, is substantially completed; and on the Boston side, under the Metropolitan Park Commission, the work is well advanced from Boylston Street bridge nearly to Arsenal Street bridge.

The treatment of the shore of the river on both sides is in general the making of a gravel beach, having a comparatively flat slope, without, however, encroaching materially upon the volume of tide water. The material for filling on both sides has been taken mainly from the bed of the river, long sections of which have been excavated to depths ranging from 10 to 20 feet below mean low water.

For quite a distance in the vicinity of the Cambridge Hospital the bed of the river was found to consist of compar-

atively soft silt, consequently this portion of the river has not been excavated as yet to any considerable extent.

Mystic River.

In December, 1897, and July, 1898, licenses were granted to the New England Gas and Coke Company to improve the water front of a large tract of land on the north shore of Mystic River in Everett. The work authorized is the construction in the mouth of Island End River of a wharf with a berth 800 feet long and 124 feet wide, with 24 to 27 feet of water at mean low water, and a channel of the same depth connecting it with the deep water of Mystic River, together with the building of bulkheads and the filling solid of about 2,000 feet of the frontage thereon.

This work is part of the large plant which the company is building here for the manufacture of coke, gas and other products extracted from coal brought from Cape Breton, N. S. In connection with the work, plans have been submitted to the Board by the Massachusetts Pipe Line Gas Company for laying pipes across Mystic River at Malden bridge, for the purpose of distributing the gas manufactured at the works of the New England Gas and Coke Company.

During the past year work has progressed under the license granted July, 1897, to the Boston & Maine Railroad to fill the flats above its Western Division bridge in Somerville. An embankment has been built from the Middlesex Avenue bridge to the railroad bridge, leaving a gap for the passage of tide water; and a contract has been made for filling the enclosed area with material dredged from the flats between the bridges, in accordance with the terms of the license. This work will be commenced in the spring.

During the year the Metropolitan Park Commission has continued the construction of the parkway in Somerville and Medford from either end of the Middlesex Avenue bridge; and this bridge, which is old and in poor condition, will have to be rebuilt in a short time, in style to conform to the parkway approaches on either side.

The wide areas of flats and upland marsh on the borders of the Mystic River as far almost as the Cradock bridge afford unsurpassed locations for manufacturing industries.

Boston is within easy distance. The towns around make healthy, cheap and comfortable homes for workmen and their families. Railroad connections in every direction are nowhere more convenient, and the river is yearly improving in navigation, under the generous appropriations of the national government. These great advantages wherein nature has been bountiful should be preserved for use in those directions which will yield the largest material benefits to this community. The comparatively cheap land areas juxtaposited between the railroads and the river furnish an unrivalled combination for building and administering manufacturing and commercial establishments under economical conditions of great superiority.

With these opportunities favorable for the growth of a great industrial development on the borders of the Mystic just now unfolding, it is to be hoped that the powers for æsthetic improvement of the entire surroundings of Boston will spare the banks of this one river from such uses and restrictions as will render them valueless for the creation of wealth and promotion of industry.

Cohasset.

Upon the request of a special committee of the town of Cohasset for the opinion of the Board with reference to the desirability of placing some kind of obstruction to the flow of the tide in Little harbor, the Board in November visited and made a careful inspection of its surroundings. It stretches well into the land, and is environed by extensive estates which make summer homes for many citizens and their families and add largely to the taxable valuation of the town.

The object of the proposed change was æsthetic and sanitary; and the liability of impairing the sanitary condition was such that the Board advised the petitioners to first settle the sanitary question by a proper scientific investigation before asking for the approval of plans, the consequences of the adoption of which might be doubtful.

Lynn Harbor.

The city of Lynn petitioned for a license to extend the outfall of the intercepting sewer system in Lynn harbor.

At the hearing serious opposition developed. Subsequently an inspection of the premises was made by the Board, and a second hearing was assigned. In the mean time, the Legislature was petitioned with reference to the subject matter, and further hearing by the Board was suspended, pending legislative action.

Subsequently the Legislature passed an act authorizing the city of Lynn to complete its system of sewage disposal, being chapter 325 of the Acts of 1898, and later plans for that purpose were approved by the Board.

Manchester Harbor.

In July complaint was made to the Board that parties were unlawfully depositing material injurious to navigation in the harbor. This harbor has been recently improved under an appropriation made by Congress. An examination was made, and the truth of the complaint ascertained. A circular containing reference to the Statutes of 1884, chapter 269, being an act for the protection of harbors and navigable waters, was posted to various parties, including shore owners, and the unlawful acts ceased.

New Bedford Harbor.

A petition was received from a special committee of the city council of New Bedford, asking for a revision and reestablishment of harbor lines in New Bedford harbor.

In November the Board visited New Bedford and held a special meeting, at which all persons interested were duly notified to be present that they might be heard. The city solicitor and city engineer appeared for the city, the interests of various wharves and corporations were represented, and the selectmen of Fairhaven were present.

No definite plan or proposition, special or general, was submitted or advocated. The general feeling seemed to be that, if some sketch or plan should be formulated whereby the riparian owners could obtain an idea of the desired change, there would be a better opportunity to present suggestions. Individual interests were represented more for the purpose of learning how they might be affected by any proposed

change than because of any desire to improve the harbor or promote the public welfare.

After listening to all parties desiring to be heard, the Board closed the hearing, and later made an inspection of the land side of the harbor. There was no exhibition of any public desire to change the harbor lines, nor were there any reasons for so doing suggested which seemed to the Board sufficient to require any recommendations to the present Legislature.

The new bridge across Acushnet River, between New Bedford and Fairhaven, is progressing, that part between Pope's Island and Fairhaven being open to public travel. When completed, it will be a handsome and durable structure, well calculated to supply a useful service for the coming century.

Boat Harbors.

The policy of providing boat harbors, where the need of them is such as to warrant the expense, on which the Commonwealth has embarked, finds favor not only with "those who go down to the sea in ships," but also with those who go to the seaside for health and recreation. It will doubtless add to the attractiveness of our shore as a summer resort; and, while adding to the inducements of yachting, boating and fishing, whereby both a knowledge and love of the sea is roused in the breast of youth, it will tend to provide safe anchorage and accessible harbors, which will become increased elements of safety and comfort to those sailing along the coast.

Lake Anthony.

By chapter 441 of the Acts of 1898 the commissioners were directed to make a survey of Lake Anthony, in the town of Cottage City, and to cut a channel between the lake and Vineyard Sound, of such character and dimensions as will afford a safe and convenient passage for boats and vessels of not less than 5 feet draft, and, if necessary, to cause the lake to be dredged and deepened, in order that it may be used as a boat harbor.

Lake Anthony is a body of water with an area of about 35 acres at high tide, situated in the town of Cottage City. It is connected with Vineyard Sound by a narrow outlet, almost completely choked with sand which has been driven

into it by the sea. At its southern end it is separated from the sound by a hill of glacial drift, which slopes to the north onto a low sand beach, over which the sea breaks into the lake in times of heavy storms, carrying the sand, which has caused the northern end to be gradually filled. At its southern end also there is an area of about 14 acres, which has a depth of over 5 feet at mean low water, and it is between this area of deep water and the sound that it is proposed to make the cut to enable the boats and vessels to pass in and out of the lake. At this place the distance across between the high-water mark of the sound and of the lake is about 125 feet, and the depth of 5 feet in the lake approaches quite near the high-water line.

Plans and specifications were prepared, providing for an opening 100 feet in width and 5 feet in depth at mean low water, the sides to be protected by pile and timber jetties; and the work was advertised June 24, 1898. Bids were received on July 7, but they all exceeded the amount available for doing the work, and thereupon were rejected.

The shore of the sound at this spot is exposed directly to the north-easterly storms, which beat very heavily; and the experience of the Board with the jetties at Menamsha convinces us that something more substantial than pile and timber jetties will have to be provided to successfully resist their action. The area of deep water in the harbor should be enlarged, and this will require dredging to be done. This is especially necessary from a sanitary stand-point, as the pond at times is very offensive, owing probably to causes which are increased by the large area of shoal water. Cottage City has a summer population of about 20,000, and is far and away the largest summer colony on the seashore of the Commonwealth. To enable this undertaking to be carried out in a proper manner, a further appropriation should be made.

Green Harbor.

In accordance with the recommendations of the Harbor and Land Commissioners and the State Board of Health, organized as a joint board to investigate and report on Green Harbor in the town of Marshfield, under chapter 495 of the Acts of 1896, the Legislature, by chapter 469 of the Acts of 1898,

appropriated the sum of $67,000 to improve the harbor below the dike by excavating an anchorage basin within the point of Duxbury beach, and opening a channel from the basin to the sea, the entrance to be protected by stone jetties.

Some delay was experienced in getting proper releases from parties who might otherwise claim damages, but who were sufficiently in favor of the improvement to release any possible claim before the work was begun. The work was advertised and bids were opened on Sept. 22, 1898, for the construction of two stone jetties to protect the entrance. Subsequently the contract* was awarded to the Rockport Granite Company of Massachusetts, and work thereon has begun.

The exposed situation of this shore and the nature of the problem presented demands that the work should be done in a more substantial and durable form than was necessary at other places.

When completed, this project will afford the people of Green Harbor and vicinity an interior anchorage basin of more than 2 acres, with a depth of 4 feet at mean low water, and with the natural outlet to the bay artificially increased to the same depth, with a width of 50 feet; the entrance to be protected by two stone jetties, extending from the beach on either side thereof, with a width of 200 feet between their outer ends.

Jetties at the Mouth of Menamsha Creek, to mark the Town Line between Gay Head and Chilmark.

By chapter 323 of the Acts of 1897 the boundary line between the two towns was established, and an appropriation of $2,000 was made. The act further provided that suitable protection should be built on the banks of either side of the outlet to the creek on the boundary line, to hold the creek in that position as a bound for defining the line.

In 1897 plans were prepared for two pile and timber jetties, to be built for this purpose. Upon the completion of the plans and specifications the work was advertised, and two bids were received. The lowest was $3,290, and that was

* See Appendix H.

about $1,500 more than the balance of the appropriation. All the bids were rejected, and it was decided to report the facts to the Legislature of 1898. It was not deemed expedient to make any changes in the plans for reducing the cost of the work, which was already calculated to be as inexpensive as would be justifiable at that place, with a reasonable expectation of making a fairly permanent improvement.

The Legislature, by Statutes of 1898, chapter 357, on the recommendation of the Board, authorized an additional appropriation of $2,000, thus making the amount available for the work $3,800. The work was then readvertised on the plans which had been prepared the year before, and the lowest bid received was $3,800. This was the full amount of the appropriation, leaving no money available for incidental work. The contract * was awarded June 20, 1898, to Charles E. Davis of New Bedford.

The act of 1897, authorizing the work, provided that before the jetties were constructed the Board should assure itself that any necessary excavation for diverting the channel of the creek to the new location on the boundary line should be done either by one of the two towns or by private individuals.

Upon examination of the locality after the act was passed, it was found that the channel had shifted by the action of the elements, so that it was then located on the boundary line, and no artificial excavation was required. The only thing it was necessary to do was to construct the jetties, one on either side of the outlet, and direct the current straight out to sea, instead of nearly parallel with the shore, as it was then running; and the plans and specifications were prepared on this basis.

The work was commenced July 23, 1898. Considerable difficulty was encountered by the contractor in driving the piles. The beach in this locality have been shifting for so many years that the coarse gravel and stone have all been sifted out and deposited in a layer about 5 feet below low water; and when the sheet piling of the jetty was driven it was found to be impossible to drive it through this layer, the lower end of the planks brooming up and crippling so that

* See Appendix D.

they could be driven no further either by the hammer or water jet.

On September 14 the driving of the sheeting across the old channel was completed, and the current diverted between the jetties. This resulted in a filling in of the old channel on the outer side of the west jetty by the action of the waves, and a portion of the channel on the inner side was also filled in, the current cutting its way through the bar which had existed on the outer side of the old channel, scouring down close along the side of the jetty, substantially to the bottom of the plank sheeting. As the work progressed and the sheeting was driven out toward the ends of both jetties, this channel increased in size; and the fishermen who use this creek stated to the inspector that it was the best channel they had had since the creek was reopened in 1895.

Owing to the insufficient depths to which the planks could be driven, it was found necessary to provide some means of preventing the scour alongside the jetty, and of diverting the current so that it would scour the channel nearer midway between the jetties. On October 8, in a heavy north-west gale, a section of the westerly jetty about 80 feet long was washed out, and about 20 to 30 feet on either side of the break was badly damaged. The outer portion of the jetty, which was exposed to heavier seas, but where it had been possible to drive the piles and sheeting to a greater depth, was not injured in any particular, although the storm was very heavy, the waves submerging the whole jetty and the beach for a distance of about 1,000 feet east of the outlet.

The material from the wrecked portion of the jetty has been removed and piled on the beach out of reach of the sea. On the north side of the wing of the east jetty the beach has built up nearly to the top of the jetty, and the high-water line has moved a considerable distance eastward. On the west of the west jetty, before it broke away, the beach had built out a considerable distance. During the construction of the work, and shortly after the current had been turned out between the jetties, on two occasions, from 11 to 16 mackerel fishermen made the creek a harbor over night, and expressed themselves as much pleased with the prospect of having a harbor of refuge which they could enter in this

locality. A further appropriation will be necessary to cover the cost of finishing up the jetties.

The Board made personal inspection of the work on September 10 and again on October 18.

OSTERVILLE.

By chapter 483 of the Acts of 1897 the Board was authorized to construct a channel for the passage of vessels through the beach between South Bay and Vineyard Sound at Osterville, provided that, after an examination by competent engineers, it was found the same could be done without injury to Cotuit harbor. The sum of $8,500 was appropriated to defray the expense of this work.

The examination was made, and in its last report the Board stated that in its opinion a cut 100 feet wide could be made through the beach without causing injury to Cotuit harbor, and recommended that the same be done, stating that about $6,500 remained unexpended and available, and it would require an additional appropriation of $7,500 to do the work.

By chapter 440 of the Acts of 1898 this appropriation was made, and the Board at once began work. Releases were obtained from the owners of the beach through which the cut was to be made, and plans and specifications were prepared for the excavation of a channel 100 feet wide and 3 feet deep at mean low water, from Nantucket Sound into and through the South Bay to a point where there was a depth of 3 feet of water at mean low tide, the cut through the beach and extending into the sound to be protected by pile and timber jetties.

On June 20 this work was advertised, bids were received July 7, and the lowest bidder, Geo. H. Cavanagh, offered to do the work for $13,690. Before awarding the contract the Board was notified that the owner of an oyster grant in the South Bay claimed damages to a large amount for the injury to his oyster flats and to his business. The Board at once commenced an investigation of this claim, and, as the cost of the work and the incidental expenses would equal, if not exceed, the amount of the appropriation, it was decided not to award the contract until this

claim could be disposed of. The matter was held in abeyance until the 7th of September, when the Board felt it could safely proceed with the work, and on that day the contract * was executed with Mr. Cavanagh.

The contractor at once commenced to prepare his plant, and began work October 3. Owing to the lateness of the season, very little was accomplished during the fall, but it is anticipated that the whole work will be completed and ready for use before the middle of the summer of 1899. Up to the present time the work has been confined to excavations in the channel within the South Bay, and the delivery of material for the jetties.

Scorton Harbor.

This harbor is formed by Scorton River, a small stream in the north-westerly portion of the town of Sandwich, emptying into Massachusetts Bay. It drains an area of about 500 acres of salt marsh and creeks. It empties into the bay through a sand beach, over which its mouth is continually shifting from west to east. From information furnished by people living in its vicinity, it was learned that about 80 years ago a cut was made through the beach, about opposite the point where the river came down to it before the present excavation. Since that time the beach has been continuously making on the westerly side of the mouth of the river, thus forcing the mouth to gradually work to the eastward, and the sand driven by the wind into the river had gradually dammed it at the level of about mean high tide.

Chapter 442 of the Acts of 1898 authorized the cut at the new outlet, and appropriated $5,000 to defray the expense of the same. Immediate steps were taken to execute the work, and on June 1 it was advertised. Plans and specifications for the work were prepared, and releases obtained from the owners of the beach through which the cut was to be made; and on June 27 a contract † was entered into with Messrs. Haynes & Lake of South Framingham, to excavate the cut for the sum of $1,825.

It was planned to make the excavation about 20 feet wide at the bottom, with sides sloping at the rate of 1½ to 1,

* See Appendix E. † See Appendix F.

the bottom at the outer end being 3 feet above low water and at the inner end about 5 feet, this being the level of the bottom of the river at that point. The expectation was that when this passage was made, the tide as it flowed in and out would cut the channel deeper and wider. This expectation has been realized.

The water in the river as it stood previous to the improvement had prevented the drainage of large areas of cranberry bogs and salt marsh, and the cut has removed the barrier. There now will be an additional inducement to attract summer residents to this vicinity. It is highly probable that the new outlet will in time work toward the east in the track of its predecessors, and become filled, thereby again damming the entrance as before. It will, however, be cheaper in the end as well as in the beginning, to allow this to occur, and then re-excavate it at some future date. Thus the cost of erecting expensive jetties and other structures for the purpose of maintaining the outlet in its present location will be saved. The storm of November 27 has already widened and deepened the cut beyond expectations, but in the directions anticipated.

The sum of $2,940 has been expended on the work, and this includes, in addition to the amount of the contract, some extra excavation which it was deemed advisable to make after the completion of the main work, as well as the cost of preliminary surveys and its supervision.

It is recommended that the unexpended balance of this appropriation be appropriated as a contingent fund for use in construction and repairs of this and similar works.

Connecticut River.

In January last the Board made a special report to the Legislature on the improvement of the navigation of the Connecticut River, as far as the cities of Springfield and Holyoke, in pursuance of a resolve of the Legislature, being chapter 82 of the Resolves of 1897 (House Doc. No. 907, 1898). As therein stated, the Board was relieved from engineering expenses attendant upon a resurvey of that portion of the river, owing to the fact that the Federal government was prosecuting a survey covering the same ground and with

the same object in view; in consequence of which, out of appropriation of $2,500, the Board was able to leave an expended balance of $1,744.75 in the treasury.

The report of the Secretary of War to the second sess of the fifty-fifth Congress contains a letter from the Chief Engineers of the Army, forwarding a report of the surv aforesaid, all of which appears in House Doc. No. 136, fif fifth Congress, second session. The report of the surv excepting maps, appears in the special report of this Bo to the Legislature in January last.

In the middle of June last the Rivers and Harbors Co mittee of Congress visited the Connecticut River at Spri field, and examined with great interest and attention river, its channels and embankments. On the 13th and 1 of June, during the visit of that committee, this Board, h ing been designated by the Governor, under the provisi of chapter 104 of the Resolves of 1898, "to represent Commonwealth on the occasion of the visit of the Commit of Congress on Rivers and Harbors, whenever such comm tee shall visit the Commonwealth in the consideration of reopening of the Connecticut River," attended the committ and gave such information relative to the situation and interests involved as was in their power. The subject m ter is now before Congress, where, if the expressions of committee of Congress shall represent their mature ju ment, made after due reflection, favorable consideration m be expected.

Chapter 498 of the Acts of 1898 added the licensing booms in and across the Connecticut River to the duties the Board. Under this authority a petition was filed w the Board by the Turner's Falls Lumber Company. asmuch as many local interests were to be affected, a p lic hearing was given at Turner's Falls. This petition now pending.

The work heretofore done in protecting the river ba at Hadley, West Springfield and Agawam from the eros effect of the currents and wave motion under high winds satisfactorily standing the test of time and use. The co paratively slight expense attendant upon keeping the ri confined within its proper limits, preserving its banks fr

erosion and thus assisting in the deepening of its channels, is well worthy of the appropriations which have been expended in that direction.

By sections 5 and 6 of chapter 344 of the Acts of 1885, a general survey of the river within the Commonwealth was projected, with the requirement that there should be deposited in the registry of deeds for the counties of Hampden, Hampshire and Franklin a copy of the survey or map of the river within the confines of the respective counties. By chapter 77 of the Resolves of the year 1896, $1,000 was appropriated for the purpose of these surveys, and work thereon progressed until the appropriation was exhausted. The result of such surveys would be a valuable contribution to the records of the counties and to the scientific data of the Commonwealth. A small annual appropriation will enable it to be prosecuted advantageously. The chief design of the survey is to furnish a correct plan of the river, which shall thereafter be a scientific basis for determining the exact character and amount of changes which shall take place, and will be used as a ground work of all future studies of the river.

Province Lands.

In pursuance of the policy of the Commonwealth, now firmly established, for the reclamation of the Province Lands, the Board has continued under the appropriation of last year the planting of beach grass on the sloping surfaces of the sand dunes most exposed to the winds sweeping down from the north-east around to the north-west quarter.

Less acreage has been planted this year, owing to the diminution of last year's appropriation. About 20 acres, however, have been covered during the season on the northern range in the vicinity of Grand View Hill and extending eastwardly along the slope for about 1,500 feet. Up to the present time about 90 acres of the sand barrens have been covered with beach grass. It shows a very satisfactory result and is effectual as a sand binder, keeping the sands from blowing about even in the most violent gales.

In addition to beach grass, a large number of young trees and shrubs from the nursery and the adjacent woods during

the past year have been placed in and among the beach grass on the northern range of dunes. There were transplanted from the nursery 300 black locust, 1,200 silver poplars and 33,000 young pines of two years' growth. The pines are of four varieties, — the seaside, Scotch, Austrian and pitch. The seaside pine, from which most was expected, is the least satisfactory, and in the two years' trial is shown to be undesirable for transplanting, while of the other varieties nearly all show fine growth. The bayberry which is found in abundance in the low grounds and bogs, is hardy, takes root readily, and is proving a valuable aid to the work in hand. The Scotch broom also after the first year shows a strong growth and invites more extensive use. While the deciduous trees grow fairly well, the evergreens will become the main dependence for protection against the winter winds. Considerable quantities of pine seed have been sown broadcast over the surface, to be set out with beach grass, or have been planted in hills among the grass. The growth of the seaside pine from seed — unlike the transplantings — is flourishing and satisfactory, and the cultivation of that species of pine in the future will be pursued by planting from the seed. There are in the nursery some 35,000 to 40,000 young trees of two years' growth ready for transplanting in the spring.

It is gratifying to realize, after several years' experience, that the method adopted for reclaiming the Province Lands is entirely successful, and that the areas planted by the Board have withstood the violence of every storm. Even the storm of November 26 and 27 of this year failed to disturb the sand or have any injurious effect on the plantation, while elsewhere the loose sand was thrown up in ridges as if it had been ploughed.

The area covered by beach grass up to the present time is about 90 acres, and there remain about 155 acres which should be covered.

Notwithstanding some dissatisfaction expressed by those unlawfully occupying the Province Lands at the time they were placed in the hands of the Board for reclamation, there is now general acquiescence and satisfaction in the situation and entire submission to the authority of the Board.

In July permission was given to the United States Lighthouse Department for the erection of a line of telephone poles across the Province Lands.

It has been the policy of the Board to extend the State road across the lands to the life-saving and lighthouse stations on the outside of the Cape. This is done not only for the convenience and comfort of the occupants of these stations, but also for the townspeople and the visitors who in summer in considerable numbers enjoy an outing across the sands. Owing to the diminution of the appropriation the past year, the Board was able to do but little work on the State road.

The work of reclamation is progressing satisfactorily, and receives interested attention from scientific experts in various parts of the country.

The report * of the Superintendent of the Province Lands gives a detailed account of the work accomplished during the year.

Wrecks and Obstructions.

Steamer "Lillie." — This vessel was burned Sept. 13, 1897, at Sagamore Hill in Hull, and was sunk in Hingham Bay. A portion of the vessel has been removed, and the remainder does not offer any obstruction to navigation.

Wood's Hole Harbor. — Dec. 15, 1897, complaint was received that the contractor who was dredging the harbor for the United States government was dumping the dredged material in the harbor, to the detriment of navigation. The complaint was referred to Maj. D. W. Lockwood, United States engineer, under whose direction the work was carried on, who assured the Board that no injury would be caused to the harbor.

Paul Boyton Chute No. 3. — Dec. 6, 1897, complaint was received that an old vessel was lying in the harbor of Fall River, in such a position as to obstruct the approach to the wharf of the Thomas Coal Company. Upon investigation it was found to be the hull of the steamer "Elm City," which had been made into the Paul Boyton Company's chute No. 3. She had been laid up for the winter at the wharf of the People's Coal Company, but had broken loose

* See Appendix I.

in a storm and been driven ashore near the wharf of the Thomas Coal Company.

As the parties in interest did not agree as to how much the channel was obstructed, the Board made a survey of the locality March 7, 1898, and it was found that the channel was not obstructed to such an extent as to prevent vessels from reaching the wharf. The owners of the wreck having promised to remove her, reasonable time was given. On March 24, 1898, the wreck was floated and towed away by the owners.

Feb. 14, 1898, complaint was received that material from buildings being torn down by the Boston Terminal Company was being thrown into Fort Point Channel, to the detriment of navigation. Notice was immediately sent to the engineer of the Terminal Company, who said it should be stopped at once. Subsequently, our inspector reported that nothing was being thrown overboard, but that all the refuse was removed inland.

June 22, 1898, notice was received that while repairing the sidewalk of Congress Street bridge a portion of the concrete covering was thrown overboard, to the detriment of navigation. Notice was sent to the office of the superintendent of bridges, and word was received that this method of disposing of the material should be stopped at once. On further inspection, it was ascertained that since the complaint was made the balance of the refuse concrete was carried away.

March 9, 1898, the engineer reported that sand was being dumped into Fort Point Channel from the wharf property near Congress Street bridge. The parties were notified to cease doing this work, and replied that they had not done any dumping. The matter was placed in the hands of the Attorney-General, and the same was subsequently settled.

April 12, 1898, complaint was made that an obstruction existed in Charles River above Harvard bridge. Upon inquiry, it was found to be a broken buoy, one which had been maintained at the expense of the tow boat companies. For the last two years they had declined to pay for maintaining them, and this one had been broken off and was dangerous to navigation. It was removed for the sum

of $10, and was placed on the flats near the Cambridge sea wall, out of the way of navigation.

June 7 and 13, 1898, notice was received that two wrecks in Salem harbor, one near the foot of Turner Street in Salem and one near West beach in Beverly, were obstructions dangerous to navigation. After investigation, it was decided to have them removed, and a contract * was made June 28 with Anton Graf of Georgetown, the lowest bidder, to break up the wrecks and place the material on shore above high-water mark, for the sum of $250. The work was completed and accepted July 18, 1898.

"*Henry Morrison.*" — June 6, 1898, Mr. O. E. Lewis reported that the steamer "Henry Morrison," Capt. Wm. Swift, had burned and sunk alongside his wharf at Winthrop, and was an obstruction to navigation. After correspondence with the agent of the insurance companies who had insured the vessel, and a conference with Captain Swift, on July 13 the wreck was removed.

Aug. 18, 1898, complaint having been received that the wreck of the steamer "City of Portsmouth" was an obstruction to navigation in Salem harbor, an examination was made; and it was learned from the collector of the port that the vessel was wrecked on Great Aqua Vitæ Shoal Aug. 25, 1894, and the next night burnt to her keel; and that the wreck did not cause obstruction to navigation, as the locality was otherwise too dangerous for any vessel or boat to be in. No further action was taken.

On Aug. 29, 1898, the schooner "S. A. Paine" of Deer Isle was wrecked on Eight-foot Shoal in Broad Sound, and on September 24 the after portion of the hull floated and was drifting up the main ship channel, a dangerous obstruction to navigation, when it was found by the harbor master and towed to the flats between Thompson's Island and Moon Head, and notice sent to this Board.

Deeming it an obstruction to navigation, the Board made a contract with Alfred Sorensen, the lowest bidder, to remove the wreck and place the material on the filled portion of the South Boston flats, for the sum of $225. The work was satisfactorily completed Oct. 31, 1898.

* See Appendix G.

In October the Board was notified that the wrecks of the schooners "Amazon" and "Little Kate," one in the Cow Yard and the other on White Flats in Plymouth harbor, were obstructions to navigation, and a contract was made with Capt. D. H. Craig of Plymouth to break up and remove the wrecks for the sum of $300. The work was completed previous to Nov. 1, 1898, the material being placed partly in the "deep hole," in the "Cow Yard," and partly in Millar's dock at Plymouth.

June 14, 1898, the engineer reported that the schooner "Caroline Knight," lime laden, which had been afire for some time in the harbor, had been grounded on the South Boston flats, east of the Burnham coal wharf, and that the owners were stripping the hull.

In the storm of November 26–27 the schooner "W. H. Y. Hackett" was wrecked alongside the bulkhead on the northerly side of the filled portion of the South Boston flats, and her owners stripped her and abandoned the hull.

One week later the schooner "Montezuma" was wrecked in the angle of the sea wall of the new pier under construction by the Commonwealth on the same flats, and her owner also stripped her and abandoned the hull.

All three of these hulks, hindering the improvements of the Commonwealth and liable to become obstructions to navigation, will be removed.

The removal of wrecks by the Commonwealth is confined to cases where the Federal government, owing to the obstruction not lying in the channels of commerce, declines to act.

Surveys.

The work on the South Boston flats, especially on the new pier and dock, has required the attention of a large part of the engineering force during the year. Outside of this, the amount of work which it was necessary to do at once, such as planning, laying out and superintending the construction of the improvements provided for by the Legislature, has been unusually large. For this reason much less has been done during the year in the way of general surveys and in preparing for future calls for information such as are constantly being made. The number of inquiries as to tides,

depth of water, structures along the shore front, kind of material forming the bottom of harbors, and similar questions, are increasing.

In December, 1897, and January, 1898, an extended survey was made for the purpose of locating the property lines on the easterly side of East Boston, in order to determine the extent of territory which should be acquired by the Commonwealth under chapter 486 of the Acts of 1897, and a large number of soundings were taken, to determine the low water lines in this vicinity.

In the latter part of January the topographical survey of Mystic River was continued, and the third plane table sheet of this locality was completed.

March 21–26 survey was made of Scorton harbor, on which to base plans for its improvement; and June 29–30 and September 13 surveys were made in connection with the laying out and execution of the work.

March 7 a survey was made of a portion of Fall River harbor, to determine to what extent the wreck of the Paul Boyton chute No. 3 had obstructed the approach to the wharves in its vicinity.

March 10–11 the plane table sheet of the Cambridge shore of Charles River was corrected and brought up to date, showing all the changes which the work of filling in that locality had made.

In April the plane table sheets of South Bay were corrected and brought up to date, showing the changes which had been caused by the filling and other work which has been done there; and, in addition, a complete hydrographic survey was made of the basin north-west of the New England Railroad, for the purpose of obtaining the necessary data to plan the work of improving the navigation of the bay and its sanitary condition, under the provisions of chapter 278 of the Acts of 1898.

In January, February, April and May surveys were made of the entrance to the reserved channel on the South Boston flats, in connection with the work of widening and deepening it under a contract with the New England Dredging Company.

In May and June a detailed survey was made of the shore

lines and hydrography of Shirley Gut, as a basis for stu
ing the changes which have occurred and are still tak
place there. Owing to the strong current through the
and the obstructions caused by the dredging going on the
many difficulties had to be overcome.

June 13 and 18 a survey was made of Lake Anthony
the adjacent shore of Nantucket Sound, whereon to b
plans for the construction, under sanitary conditions, o
boat harbor, with the view of accommodating the inhabita
of Cottage City, under the provisions of chapter 441 of
Acts of 1898.

July 12 and September 28–29, surveys were made at Gr
Harbor for determining the exact location and staking
the proposed jetties, under the provisions of chapter 469
the Acts of 1898.

From July 20 until the completion of the work, Nov
ber 1, an assistant was engaged in supervising and giv
lines and grades for the construction of the jetties at
mouth of Menamsha Inlet, on the boundary between
Head and Chilmark.

September 19 and 20, surveys were made at Osterville
staking out the proposed channel between South Bay
Nantucket Sound, and the jetties to protect the entrance.

The results of the surveys have been recorded on suita
plans, and the data thereby furnished have been used in
paring plans and estimates for the various improvements
making calculations of work done and in studies of vari
kinds for the benefit and improvement of navigation.

Numerous examinations have been made from time to t
of the structures which have been built under licenses f
the Board, and thereon calculations are based of the amo
of tide water displaced by each structure, for the purpose
making the charge for such displacement provided by sec
14, chapter 19, of the Public Statutes. These surveys f
the basis from which the Board calculates the areas of pu
land which are to be occupied by licensed structures, as
as the amount of tide water which is displaced by their bu
ing. The surveys are prosecuted from time to time e
year, whenever the field party can be spared from m
pressing duties.

The Great Storm in November.

A great storm, unprecedented, within the memory of any now living, for severity and destructiveness, and comparable only with that of April, 1851, which swept away Minot's Ledge lighthouse, ravaged the New England coast on Sunday, Nov. 27, 1898, and was particularly disastrous along the Massachusetts shores. More than 200 vessels were wrecked, and upwards of 300 lives lost on Cape Cod and within the circuit of Massachusetts Bay, the saddest incident being the foundering of the steamer "Portland" off Race Point, probably, every one of about 170 persons on board going down with the vessel.

The gale, accompanied by heavy snow, was generally from north-east, and, beginning with a light wind at about 8.30 o'clock on the previous evening, rapidly increased in violence, reaching its maximum velocity of 72 miles an hour, near high water, about 11 o'clock on Sunday forenoon, then subsiding during the afternoon, and the weather clearing by the next morning.

A very full tide, exceeding in height, it is said by those who have knowledge of it, that of "Minot's Light gale," lashed the entire coast with surf of tremendous violence. All the beaches, which in recent years had become populous summer resorts, and were covered with cottages and pleasure structures, were swept by the gale and sea, entailing destruction of property of this class amounting to hundreds of thousands of dollars, while the more serious feature was presented of wide breaches in the natural defences of some harbors, or the reduction of their height for long distances where the waves washed across them, by which the safety of some havens and anchorages is now greatly endangered.

This was especially the case at Plymouth, Duxbury and Hull, the authorities of which towns early called the attention of this Board to the existing danger, and asked that any possible measures for protection might immediately be afforded.

Having no power for relief in these matters, which pertain to the general government, the Board directed the petition-

ers to Col. Charles R. Suter, the United States Army engineer in charge of this coast district.

While unable to take other action in this emergency, the Board has deemed it advisable, if for purposes of record only, to obtain as full information as possible with regard to the inroads of the ocean upon the coast line, together with other data which may prove useful, or at least interesting, for the future. Accordingly a series of questions was prepared, and, accompanied by a suitable circular requesting response to the same, sent to the selectmen of the towns and mayors and aldermen of cities bordering on our sea coast, as also to keepers of life-saving stations, and other persons whose experience and knowledge of the situation might make their report of especial value.

Replies to these inquiries were received and have been placed on file for future reference.

These replies appear to establish the fact that the headlands of Martha's Vineyard, Nantucket, Cape Cod and the shores of Massachusetts Bay, from Barnstable to Point Allerton, including the exposed islands of Boston harbor, and thence around to the rocky promontories of Cape Ann, have been severely eroded. At the head of Warren's Cove, below Plymouth, for instance, 20 feet of the bluff was carried away, and at Manomet, Elisha's Point was partially cleared of forest growth and a sand beach created in its place, affording passage for teams where none had before existed. At Duxbury, Powder Point, which lies wholly within the harbor, and has never before suffered from storms, was reached by the surf that broke through the outer beach, and for a distance of about 800 feet, on the south side, the bluff was eroded from 10 to 20 feet. On the north side of the point, where the bank is bolder, the amount of material cut away was considerably greater.

The difference in the levels of the water, between Sandwich on the north side of the Cape, at high tide, and the head of Buzzards Bay, from the reports received, — without verification, — is estimated to have been about 13 feet, the time of high water on the north side occurring within about an hour of low water on the south side. At Vineyard Haven occurred the greatest number of marine

disasters, as many as 42 schooners and barges, including a barkentine, having been driven ashore, sunk, dismasted or badly damaged. Fifteen men were rescued from the rigging of vessels, and but one life was lost.

The waves rolled over and levelled the crests of the beaches, clearing them of cottages and other property; created much havoc along the inner shores of the basins, strewing them with vessels and boats torn from their anchorage; washed out and demolished wharves; and displaced railroad tracks, lifted bridges, and at Sandwich even destroyed a section of State highway nearly a mile inland. At Plymouth, for half a mile, the head of Long beach was carried over into the bed of Eel River, completely blocking the stream and obliging it to seek a new outlet directly to the sea, in place of flowing into and through the harbor, as it has done during this century. For a distance of 9,000 feet the beach was overwhelmed and all cottage property upon it destroyed.

Through Salter's beach, northward of the Gurnet, there were numerous washings, and at the end of Powder Point bridge in Duxbury an extensive break was made in the beach, nearly a mile in length, reducing its height in several places to about half-tide depth. It was through this breach that the furious seas rolled which swept about a dozen vessels from their anchorages in the "Cow Yard" in Plymouth harbor, only one of the entire fleet, by cutting away her masts, succeeding in holding on. The "Cow Yard" is esteemed by the government as one of the safest of anchorages, and is the only one southerly of Boston for a distance of 75 miles; the holding ground being excellent and its approach from sea direct, deep and accessible for vessels of large draft. In former days, when the fishing industry of the State was prosperous, it often sheltered a hundred or more vessels at once. It will thus be seen that the imperilling or practical destruction of this only refuge for vessels falling to leeward of Boston, in stress of weather, is a matter of extreme importance.

One of the unexpected and beneficial results of the storm, proving the truth of the adage that "Ill blows the wind that profits nobody," occurred at Marshfield and Scituate, where, after destroying a large amount of shore property at Green

Harbor, Brant Rock and Scituate harbor, the sea opene
new passage into North River, between the "third" a
"fourth cliffs." The current has since been widening a
deepening the cut, until it is now 250 feet wide and fr
13 to 15 feet deep at low water, the tide ebbing and flow
in the inlet as naturally and quickly as at sea. The basi
as large or larger than Scituate harbor, with a depth of
feet in some places, and lies where for many years it
been contemplated, and attempts have been made to sec
a harbor.

North River, which is 20 miles long, was once import
as a waterway, vessels of considerable size having been b
upon it, and a line of packets sustained as the regular me
of freighting between Boston and the towns upon its ban
For many years, however, it has been unnavigable from
practical closing of its mouth by sand bars. Now a fine d
harbor has been opened, which, by giving easy access
fishing boats and pleasure craft, will be of great advant
to the towns of Marshfield, Scituate, Norwell, Hanover a
Pembroke, furnishing as it does a haven, as also a short a
convenient passage to the bay.

At Cohasset and Hull the beaches separating Straits P
from the ocean were badly washed, portions of the fine sh
highways destroyed, and extensive damage done to all sh
property. The destruction at Nantasket and Hull was seri
in loss of buildings, the famous beach being everywher
scene of disastrous wreckage. Sea walls and bulkhe
around to Point Allerton were carried away, and large tra
of upland, as well as the roadways and railroad tracks, w
buried deep under shingle and sand thrown over the wa
swept crests of the beaches.

In Boston harbor the damage was considerable. Some
sloops, schooners, barges, scows, launches and steamers,
cluding the steamship "Ohio," broke from their moorings
anchorages and were driven ashore, several of them becom
total wrecks. Outside the harbor, off Hull, two large
barges and three schooners were wrecked and several li
were lost.

On the northerly side of Long Island about 300 to
feet of the bank was washed down, and on the east and w

sides of the island the banks were cut into from 4 to 6 feet; also about 40 feet of the sea wall at the west head, and the bath houses, were washed away, the lowlands flooded and the wharf damaged.

At Deer Island most of the sea wall on the north-easterly side and about 800 feet of the bulkhead at Shirley Gut were destroyed, and the low grass lands were flooded.

At George's Island about 300 feet of the sea wall was damaged and the embankment washed out.

At Lovell's Island about 500 feet of the sea wall was knocked down.

At Gallop's Island the riprap at the north-easterly end was washed out in places and the wharf badly damaged.

At Rainsford Island about 500 feet of bulkhead at the easterly side and 350 feet of the wharf were wrecked; also the piggery was washed away and the lowlands flooded. The tide rose into the boiler room of the institution, and put out the fires.

At Thompson's Island the wharf was damaged, the dikes were washed down, the lowlands were flooded, the beach road was washed out in places, and the heavy timber foundations on the water side displaced.

In addition to the foregoing, some of the wharves at the city proper were injured, and lesser damage in various parts of the harbor was caused by the violence of the winds and waves.

Around on the north shore, from Point Shirley to that part of the coast where granite formation constitutes the ocean barrier, the storm did its work in cutting away at the headlands and pounding the beaches. At Revere an opening was made which allowed the sea to inundate a large tract of inside territory, causing distress to many poor people living in tenements reached by the tide; but prompt measures for closing the breach, adopted by the town authorities, have since given relief. At the State reservation in that town the strong sea wall generally resisted the assault, but the boulevard was considerably torn, and its surface covered with material from the adjoining beach. Marblehead, Gloucester, Lynn and Swampscott suffered from the tide and heavy surf, the Nahant beaches being severely treated.

From the data gathered with regard to the height of the tide, it appears, in absence of previous record, that general opinion places the maximum at about 3 feet above ordinary high water; while, as related to that of the "Minot's Light gale," estimates place it between 2 feet lower and 2 feet higher than in that memorable storm. The floor of a house on Front Street in Scituate, owned by John H. Smith, is mentioned as the limit reached by the tide in 1851, while in the late storm the flow was 5 inches higher. This seems to be the most authentic comparison obtainable.

Reports from sheltered harbors on Buzzards Bay state that the tidal flow of Nov. 27, 1898, was no higher than ordinary, but the low course was unusual, while at places on Martha's Vineyard, and also at Cape Ann, the rise was but a few inches more than usual.

The force of the wind much exceeded that of the gale of 1851, of which, however, there is unfortunately no record existing for comparison.

It being deemed important that official meteorological memoranda of this extraordinary storm should also be made a part of this report, the following is appended, being furnished by Mr. J. W. Smith, the United States local forecast official at Boston: —

The wind was from north-east during the afternoon of the 26th and until 2 A.M. of the 27th, then north until 5 P.M. of the 27th, afterwards north-west. The velocities were light in the early afternoon of the 26th, but gradually increased to a rate of 24 miles an hour at 10 P.M., then rapidly to a rate of 38 miles an hour at 11 P.M., after which time the average hourly rate was between 40 and 50 miles an hour until about 1 P.M. of the 27th, then diminishing to velocities between 24 and 30 miles an hour in the evening and night of the 27th. The highest hourly rate for any consecutive five minutes was at 11 A.M. of the 27th, with a single mile at a rate of 72 miles an hour.

The precipitation was in the form of snow, beginning at 7.37 P.M. of the 26th, and ending during the night of the 27th, 12.5 inches falling during the storm, about 9 inches of which fell during the night of the 26th.

The temperature ranged from 30 to 35 degrees during the afternoon and night of the 26th, and until 2 A.M. of the 27th, when it

fell to 28, ranging near that point during the remainder of the day of the 27th.

The pressure began to fall at 10 A.M. of the 26th, then reading 30.14 inches, and fell to lowest of 29.30 inches from 4 to 6 A.M. of the 27th, rising slowly during the remainder of the 27th.

Work of the United States in Rivers and Harbors of the Commonwealth.

The following statements, made by Col. Charles R. Suter, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts (having recently succeeded Col. Samuel M. Mansfield), and by Maj. D. W. Lockwood, Corps of Engineers, U. S. A., who is in charge of similar improvements in southern Massachusetts, show the work accomplished in the rivers and harbors of this Commonwealth during the year: —

Statement of Col. Charles R. Suter, Corps of Engineers, U. S. A.

Jan. 7, 1899.

The Harbor and Land Commissioners, Commonwealth of Massachusetts, Boston, Mass.

Gentlemen: — In accordance with your request of Dec. 1, 1898, I have the honor to furnish the following summary of the work done by the United States during the year 1898, in the rivers and harbors of Massachusetts which are under my charge: —

Newburyport Harbor.

The project for the improvement of the harbor has not been changed.

The north jetty is 2,705 feet long; the south jetty 1,790 feet long.

No work has been done under the project during the year.

Harbor of Refuge, Sandy Bay.

The project remains unchanged.

The act of June 3, 1896, appropriated $150,000 for this improvement.

Operations during the year under a contract with the Rockport, Pigeon Hill and Cape Ann granite companies, were continued. Under this contract 106,817 tons of rubble stone were deposited in extension of the substructure of the breakwater during the year.

Gloucester Harbor.

No change in the general project has been made.

The act of June 3, 1896, appropriated $34,000 for this harbor; of which $2,000 was expended in 1897 in removing certain rocks from the outer and inner harbor, and the remaining $32,000 was expended in extending the substructure of the breakwater.

Under a contract with the Rockport, Pigeon Hill and Cape Ann granite companies, 8,069 tons of rubble stone were deposited in the breakwater during the year, and the contract was completed in April, 1898.

Manchester Harbor.

No appropriation has yet been made for carrying out the project submitted on July 30, 1897.

Lynn Harbor.

No change has been made in the project, which has been completed, excepting the construction of the training wall to aid in keeping the outer channel open, the necessity for which is not yet apparent.

Boston Harbor.

No change has been made in the project.

Operations were continued during the year under the continuing contract dated Feb. 11, 1897, with Messrs. Breymann Bros. of Toledo, O., to dredge 2,910,718 cubic yards, more or less, of material from and in completion of the proposed main ship channel.

During the year 797,350 cubic yards of material have been dredged from "The Narrows," resulting in an increased width of about 150 feet throughout this difficult passage, and a more notable improvement at Nix's Mate Shoal, where the channel has been increased 350 feet in width.

The sundry civil act of June 4, 1897, and July 1, 1898, appropriated sums aggregating $650,000 for this work; which funds are sufficient to complete all dredging work under the contract of Feb. 11, 1897, and leave a substantial balance applicable to removal of ledges uncovered by dredging.

Scituate Harbor.

No change has been made in the project, and no work has been done during the year.

Plymouth Harbor.

No work has been done during the year.

The severe storm of Nov. 27, 1898, seriously damaged the beach, and the funds available are inadequate to make necessary repairs.

Wellfleet Harbor.

No change has been made during the year.

Provincetown Harbor.

No work has been done during the year.

Chatham Harbor.

No change has been made in the condition of the harbor during the year.

During the year no changes have been made in the channels of the following rivers: Merrimac River, Powow River, Essex River, Mystic and Malden rivers, Town River, Weymouth River.

Wrecks.

In May a portion of a wreck, name unknown, was removed from Chatham old harbor, Mass., by Joseph N. Bloomer, under contract dated May 10, 1898.

In December the wreck of schooner "J. M. Eaton" was reported an obstruction to navigation in the entrance channel to Pigeon Cove Harbor, Rockport, Mass. An allotment has been asked for, for the removal of this wreck.

Examinations and Surveys.

On Jan. 8, 1898, a report and plan of survey of Merrimac River, from Lowell to New Hampshire State line, was submitted to the department. No project of improvement of the channel was recommended.

Very respectfully, CHAS. R. SUTER,
Colonel, Corps of Engineers.

STATEMENT OF MAJ. D. W. LOCKWOOD, CORPS OF ENGINEERS, U. S. A.

Abstract of work of river and harbor improvement in the State of Massachusetts by the United States government, under the direction of Maj. D. W. Lockwood, Corps of Engineers, U. S. A., for the fiscal year ending June 30, 1898: —

Taunton River.

No work was done during the fiscal year.

The channel has been practically completed from Weir bridge, Taunton, to the lower end of the "Needles," giving a width of 60 feet, with a minimum depth of 11 feet at mean high tide. At a few points below the "Needles" a small amount of widening and deepening the channel is required to complete the project.

Hyannis Harbor.

The work of dredging, under contract with the Hartford Dredging Company, was commenced Sept. 15 and completed Dec. 9, 1897; 25,803 cubic yards of material were excavated, adding about 3.6 acres to the dredged area protected by the breakwater, and two cuts, each 25 feet wide and 13 feet deep at mean low water, were made into the wharf of the New York, New Haven & Hartford Railroad Company. An area of 9.4 acres still remains to be dredged to a depth of 15.5 feet, to complete the present project.

Nantucket Harbor.

Work under the contract for jetty construction, in progress at the beginning of the fiscal year, was completed in September 1897; 9,625 tons of stone were placed in the west jetty, extending it by about 1,000 feet in length, raised to the level of 1.5 feet below mean low water, with mounds every 200 feet extending above high water. The light on this jetty was then moved to the outer end of the new work.

Vineyard Haven Harbor.

Work under the contract for riprap sea wall and jetties, in progress at the beginning of the fiscal year, was completed Sept. 30, 1897; 4,974 tons of stone were placed, by which 2,130 feet (making 2,400 feet in all under the contract) of riprap wall were constructed along the low water line in front of the bluff on the east side of the West Chop, and 13 short jetties from the sea wall to the foot of the bluff; and on the East Chop, 250 feet of sea wall and 1 jetty were constructed, completing all proposed work.

Wood's Hole Channel.

The work of dredging and removing bowlders, under the contract in force at the beginning of the fiscal year, was completed Dec. 27, 1897; 2,450.68 cubic yards of sand and bowlders were removed, making two cuts, each 35 feet wide and 13 feet deep at mean low tide, through the shoal at the eastern entrance of the channel or strait leading into Buzzards Bay.

New Bedford Harbor.

No work has been done in this harbor during the past fiscal year.

Canapitsit Channel.

Work under the contract for dredging, in progress at the beginning of the fiscal year, was continued until Sept. 4, 1897, when it was suspended, the dredge employed having removed all the material that it could by that date, the remaining work of removing large bowlders being completed in June, 1898. During the year 5,638 cubic yards of sand, gravel and small bowlders and 89.1 cubic yards of large bowlders were removed from the channel, giving it a depth of 6 feet at mean low water, with a least width of 150 feet, thus completing the project.

Removal of Wrecks.

During the fiscal year the following wrecks were removed, so as to no longer form obstructions to navigation: —

Schooner "R. L. Dewis," sunk by collision in Vineyard Sound, about midway between Hedge Fence and Squash Meadow Shoals.

Schooner "Mary B. Smith," Vineyard Haven harbor.

Schooner "Asia," sunk on Killpond Bar, about 1 mile E.S.E of Bass River light station.

Barge "Excelsior," sunk on Killpond Bar, about 2 miles S.E. of Bass River light station.

Schooner "Angola," sunk in Vineyard Sound, 1 1-4 miles W.-N.W. of Cross Rip light ship.

Preliminary Examinations.

The following preliminary examinations were made, and reports thereon submitted to the Chief of Engineers and the Secretary of War: —

Herring River, Harwich, Mass. — Owing to the expense of constructing suitable works for obtaining a channel of even moderate depth, and to the purely local character of the benefits to be derived, the locality is not considered worthy of improvement by the general government.

Salt Pond, Harwich, Mass. — There being no local commerce at present, and no prospective commerce at all commensurate with the cost of securing an entrance depth that would be of any practical use, the locality is not considered worthy of improvement by the general government.

INSPECTIONS MADE BY THE BOARD DURING THE
1898.

Jan. 17. Outfall sewer, in Lynn harbor, relative to
extension and the licensing of work done b
of Lynn.

22. Congress Street bridge and Fort Point Cha
complaint that material from said bridge
dumped into tide water.

March 4. Site of obstruction to navigation in Fall Rive
near the wharf of the Thomas Coal Compa
of proposed structure of the Weetamoe Y
in Fall River harbor. Salter's Beach, in P
relative to the removal of material.

11. Wharves of A. H. Tower and N. B. Tower, in
harbor.

18. Work in progress on the new pier and doc
South Boston flats, under chapter 513 of
of 1898.

25. Scorton River, in Sandwich, relative to prop
outlet through Spring Hill Beach, under ch
of the Acts of 1898.

29. Wharf and dock of the New Bedford Gas an
Light Company, on Acushnet River, in N
ford, relative to proposed structure.

April 1. Alleged illegal structure in Winthrop, near
Winthrop Steamboat Company.

4. Premises of the New England Gas and Coke C
on Mystic River and Island End River, in
Charlestown Park and the wharf of A. M.
on Mystic River. Park of the city of B
the south channel of Mystic River. Mystic
of the Boston & Maine Railroad.

4. Site of proposed sewer outlet in Gloucester h

6. Alleged illegal structure in Winthrop, near
Winthrop Steamboat Company.

12. Site of obstruction to navigation in Charles
a point above Harvard bridge.

14. Dredging being done by Perkins, White &
in Shirley Gut, Boston harbor.

18. Beach in Swampscott, relative to the proposed
of material.

25. Wharves of Geo. C. Elliott and others on
River, in Haverhill.

27. Wharf of the Boston Yacht Club, in South B

1898.

pril 28. Beach in Revere, relative to the proposed removal of stones.

ay 11. Beach at Point Allerton, in Hull, relative to the proposed removal of material.

12. Shirley Gut, in Boston harbor, in connection with a survey of the same, in progress. Wreck of Steamer "Lillie," in Hull Bay.

19. Site of proposed jetties at Menamsha Inlet, in Gay Head and Chilmark. Site of proposed wharf of James A. Barnes in Vineyard Haven harbor. Lake Anthony, in Cottage City, relative to the construction of a channel under chapter 441 of the Acts of 1898. Great Herring Pond in Plymouth.

20.

25. Site of proposed bridge on the Connecticut River at Northfield.

June 2. Premises of Joel F. Sheppard on Weymouth Fore River in Weymouth.

3. Site of proposed sewer extensions by the city of Fall River, in Fall River harbor. Wharf of Jerome C. Borden, in Fall River harbor.

16. Beaches in Marblehead, relative to the proposed removal of material. Site of wrecks in Salem harbor and Beverly harbor.

16. Lake Anthony, in Cottage City, in connection with a survey of the same in progress, under chapter 441 of the Acts of 1898.

17.

23. Wreck of Steamer "Henry Morrison," in Winthrop harbor.

29. Shirley Gut, in Boston harbor, relative to dredging.

July 1. Site of proposed work in Osterville, under chapter 483 of the Acts of 1897 and chapter 440 of the Acts of 1898. Work at Scorton harbor, in Sandwich, under chapter 442 of the Acts of 1898.

2.

12. Green harbor, in Marshfield, relative to proposed work under chapter 469 of the Acts of 1898.

15. Site of wrecks in Salem harbor and Beverly harbor.

19. Work being done by the Boston Terminal Company on Fort Point Channel. Wharf of the Whittier Machine Company on Fort Point Channel. B Street and other portions of the South Boston flats.

20. Lake Quannapowit, in Wakefield, relative to alleged encroachments without authority from the Board. Weeks' wharf in East Boston, relative to proposed rebuilding.

1898.

July 20, 22, 28. Work at Menamsha Inlet, in Gay Head and Chilmark, under chapter 323 of the Acts of 1897 and chapter 357 of the Acts of 1898.

22. Manchester harbor, relative to alleged dumping of material without authority from the Board.

Aug. 3. Stony beach, in Hull, relative to the proposed removal of material.

8. Cooper's Pond, in North Carver.

11. Wharf of the Whittier Machine Company, on Fort Point Channel, in Boston.

16. Work being done in Fort Point Channel, below Broadway bridge. Otis wharf on Atlantic Avenue in Boston, relative to alleged dumping of material without authority from the Board.

18, 19. Work at Menamsha Inlet, in Gay Head and Chilmark, under chapter 323 of the Acts of 1897 and chapter 357 of the Acts of 1898.

20, 27. Work at Scorton harbor, in Sandwich, under chapter 442 of the Acts of 1898. Work at Osterville, under chapter 483 of the Acts of 1897 and chapter 440 of the Acts of 1898.

23. Salem harbor, relative to wreck of "City of Portsmouth."

29. Clifford's Pond, in Greenwich, relative to alleged encroachments without authority from the Board.

Sept. 9. Work at Scorton harbor, in Sandwich, under chapter 442 of the Acts of 1898.

10. Work at Menamsha Inlet, in Gay Head and Chilmark, under chapter 323 of the Acts of 1897 and chapter 357 of the Acts of 1898.

20. Beaches in Marblehead, relative to the removal of material.

29. Dike and sluiceway of the New England Gas and Coke Company, in Everett.

Oct. 1. Tufts' wharf on Charles River, in Boston, relative to proposed filling of dock.

2, 18, 19. Work at Menamsha Inlet, in Gay Head and Chilmark, under chapter 323 of the Acts of 1897 and chapter 357 of the Acts of 1898.

4. Damon's beach, in North Scituate, relative to the proposed removal of material.

14. Beach in Swampscott, relative to the proposed removal of stones.

1898.

Oct. 14. Work at Scorton harbor, in Sandwich, under chapter 442 of the Acts of 1898. Work at Osterville, under chapter 483 of the Acts of 1897 and chapter 440 of the Acts of 1898.

15. Work done by the Commonwealth on the Province Lands, in Provincetown.

21. Work in progress on the new pier and dock on the South Boston flats, under chapter 513 of the Acts of 1898.

25. Salter's beach, in Plymouth, relative to the alleged removal of material from localities not covered by a permit from the Board.

Nov. 5. Sites of wrecks in Plymouth harbor.

7. Site of proposed structure of the Quincy & Boston Street Railway Company on Neponset River, adjoining Neponset Avenue in Boston.

11. Beach between Point Allerton and Strawberry Hill, in Hull, relative to the proposed removal of material.

14. Little harbor, in Cohasset, relative to the construction of tide gates.

18. Beaches in Marblehead and Swampscott, relative to the removal of material. Marine Railway of W. B. Stearns, in Marblehead harbor.

21. Merrimac River, in Haverhill, relative to the alleged dumping of material without authority from the Board.

Licenses granted during the Year.

Nos.

2083. Petition of the New England Gas and Coke Company for license to build bulkheads and pile wharf and fill solid in Mystic River and Island End River in the city of Everett. Granted Dec. 10, 1897.

2084. Petition of C. C. Hanley for license to build a wharf, partly solid and partly on piles, on Town River in the city of Quincy. Granted Dec. 10, 1897.

2085. Petition of Emily E. Sears for license to build a wall and canal and exclude tide water from a creek at Patch's beach in the city of Beverly. Granted Dec. 10, 1897.

2086. Petition of Perkins, White & Co. for license to build a temporary pile wharf in Quincy Bay, at Moon Island, in the city of Quincy, and to dredge material in the vicinity of said wharf. Granted Dec. 10, 1897.

Nos.

2087. Petition of the New England Gas and Coke Company for license to fill solid in Island End River and the Mill Pond branch of said river in the city of Everett. Granted Dec. 13, 1897.

2088. Petition of the Boston Wharf Company for license to build a sea wall and fill solid in Fort Point Channel in the city of Boston. Granted Dec. 13, 1897.

2089. Petition of the city of Boston for license to dump snow and ice into tide waters. Granted Dec. 13, 1897.

2090. Petition of the proprietors of Boston Pier or the Long Wharf for license to widen a portion of Long Wharf, on piles, in Boston harbor in the city of Boston. Granted Jan. 31, 1898.

2091. Petition of William Minot for license to build bulkheads and jetties and dredge a boat harbor in Buzzards Bay at Bourne's Cove in the town of Wareham. Granted Jan. 31, 1898.

2092. Petition of William Minot for license to build a bulkhead and jetties and dredge a boat harbor in Buzzards Bay at Bennet's Neck in the town of Bourne. Granted Jan. 31, 1898.

2093. Petition of John Smith and John L. Mitchell for license to build a pile wharf in Hull Bay in the town of Hull. Granted Jan. 31, 1898.

2094. Petition of Frank E. Davis for license to extend his wharf, on piles, in Gloucester harbor in the city of Gloucester. Granted Jan. 31, 1898.

2095. Petition of the city of Boston for approval of plans for the construction of a stone abutment and retaining walls for a bridge to be built across Fort Point Channel in the city of Boston, as authorized and directed by chapter 516 of the Acts of 1896 and chapter 512 of the Acts of 1897. Granted Feb. 4, 1898.

2096. Petition of the New England Telephone and Telegraph Company of Massachusetts for license to lay a submarine conduit for its cables and wires under the draw of Warren bridge in Charles River in the city of Boston. Granted Feb. 4, 1898.

2097. Petition of John J. Horgan for license to maintain a bulkhead and solid filling in a dock on Broad Canal in the city of Cambridge. Granted Feb. 10, 1898.

2098. Petition of Charles A. Morss for license to maintain a bulkhead and solid filling in a dock on Broad Canal in the city of Cambridge. Granted Feb. 10, 1898.

Nos.

2111. Petition of George G. Crocker and Edward P. Fisk, trustees, and others, for license to fill flats lying southerly of Main Street and between West Boston Bridge and land of the Charles River Embankment Company in Charles River in the city of Cambridge. Granted March 9, 1898.

2112. Petition of Abraham H. Tower and Newcomb B. Tower for license to maintain pile structures and buildings in Cohasset harbor in the town of Cohasset. Granted March 15, 1898.

2113. Petition of Helen Hamlin for license to maintain a pier and float stage in Marion harbor in the town of Marion. Granted March 28, 1898.

2114. Petition of William W. Phinney for license to build launching ways and a pile structure in Buzzards Bay at Monument Beach in the town of Bourne. Granted March 28, 1898.

2115. Petition of the International Paper Company for license to maintain a solid-filled wharf on Merrimac River in the city of Haverhill. Granted March 28, 1898.

2116. Petition of the city of Boston for license to build bulkheads and pile structures and fill solid in Dorchester Bay at Old Harbor Point in the city of Boston. Granted April 1, 1898.

2117. Petition of the Hyannis Yacht Club for license to build and maintain a pile pier in Lewis Bay in the town of Barnstable. Granted April 1, 1898.

2118. Petition of Mrs. Ella Shearer for license to build and maintain a pile pier and float stage in Quisset harbor in the town of Falmouth. Granted April 4, 1898.

2119. Petition of the New Bedford Gas and Edison Light Company for license to build a sea wall and fill solid in Acushnet River in the city of New Bedford. Granted April 4, 1898.

2120. Petition of Thomas W. Carter for license to build sea walls, bulkheads and a pile platform, and construct a dock, on Neponset River easterly of Granite bridge in the town of Milton. Granted April 7, 1898.

2121. Petition of the trustees of the Hingham, Weymouth and Quincy bridges for license to widen a portion of Weymouth Fore River Bridge, at its easterly end, on Weymouth Fore River in the town of Weymouth. Granted April 7, 1898.

Nos.

2122. Petition of Benjamin F. Brown for license to fill flats in Charles River basin, adjoining the southerly side of Main Street in the city of Cambridge. Granted April 12, 1898.

2123. Petition of the Board of Metropolitan Park Commissioners for license to fill solid and change the south-westerly shore line of Charles River, and construct drain outlets, between North Harvard Street and Western Avenue in the city of Boston. Granted April 12, 1898.

2124. Petition of Nannie R. Rice for license to extend the present pier and locate and maintain a float stage in Sippican harbor at Ram Island in the town of Marion. Granted April 12, 1898.

2125. Petition of the city of Boston for license to rebuild a portion of the pier of Broadway bridge on Fort Point Channel in the city of Boston. Granted April 12, 1898.

2126. Petition of the town of Hull for license to lay a cast-iron sewer pipe in and under the portion of Boston harbor known as Nantasket Roads. Granted April 12, 1898.

2127. Petition of the trustees of the Wing's Neck club-house, for license to rebuild a wharf in Buzzards Bay at Wing's Neck in the town of Bourne. Granted April 12, 1898.

2128. Petition of the town of Bourne for approval of plans for constructing a highway bridge across Barlow's River in the town of Bourne, as authorized by chapter 139 of the Acts of 1896. Granted April 13, 1898.

2129. Petition of Edith H. Eustis for license to build walls in Red Brook harbor and Cataumet harbor at Scraggy Neck in the town of Bourne. Granted April 18, 1898.

2130. Petition of the city of Boston for license to drive piles in the pier of Broadway bridge on Fort Point Channel in the city of Boston. Granted April 18, 1898.

2131. Petition of the town of Mattapoisett for license to lay and maintain a cast-iron pipe sewer in and under Mattapoisett harbor in the town of Mattapoisett. Granted April 18, 1898.

2132. Petition of Elizabeth D. Pratt for license to build and maintain a boat landing in Great Herring Pond in the town of Plymouth. Granted April 18, 1898.

2133. Petition of the Boston Yacht Club for license to build two pile piers and two dolphins in Old Harbor Bay in the city of Boston. Granted April 18, 1898.

Nos.

2134. Petition of the Jubilee Yacht Club for license to bu maintain a pile pier and float stages in Beverly h Tuck's Point in the city of Beverly. Granted A 1898.

2135. Petition of the city of Lynn for approval of pl building a wooden box sewer in Lynn harbor, as ized by chapter 325 of the Acts of 1898. (April 27, 1898.

2136. Petition of the Provincetown Cold Storage Comp license to lay and maintain a water pipe and c two dolphins in Provincetown harbor in the Provincetown. Granted May 4, 1898.

2137. Petition of Helen Hamlin and others for license piles and locate and maintain float stages in S harbor in the town of Marion. Granted May 12

2138. Petition of the New York, New Haven & Hartfo road Company for license to rebuild and widen it on piles, in Provincetown harbor in the town of P town. Granted May 13, 1898.

2139. Petition of Benjamin G. Hathaway for license to r a marine railway, and to extend the same, also t and maintain a float stage, in Marblehead harb town of Marblehead. Granted May 17, 1898.

2140. Petition of the Butchers' Slaughtering and Melting tion for license to build a pile wharf on Charles Brighton in the city of Boston. Granted May 1

2141. Petition of the United States for license to build bulkhead and pile wharf, and fill solid in Bostor at Peddock's Island. Granted May 23, 1898.

2142. Petition of the United States for license to buil wharf in Boston harbor at Long Island Head. May 23, 1898.

2143. Petition of Christopher T. Harris for license to boat landing, on piles, in Great South Pond in of Plymouth. Granted May 23, 1898.

2144. Petition of James A. Barnes for license to build a in Vineyard Haven harbor, in the town of Cott Granted May 24, 1898.

2145. Petition of the Board of Park Commissioners fo to fill solid in Dorchester Bay in the city of Granted June 2, 1898.

2146. Petition of George C. Elliott for license to build or bulkheads and fill solid in Merrimac River in of Haverhill. Granted June 2, 1898.

Nos.

2147. Petition of Joseph Henry Beale for license to build and maintain a pile pier and float stage in Barnstable harbor in the town of Barnstable. Granted June 8, 1898.

2148. Petition of Stephen M. Weld and William Minot for license to build a dike across Bourne's Cove in the town of Wareham. Granted June 8, 1898.

2149. Petition of Albert H. Eichorn for license to build a temporary pile pier in Dorchester Bay, at Squantum in the city of Quincy. Granted June 10, 1898.

2150. Petition of Joel F. Sheppard for license to build a sea wall and fill solid in Weymouth Fore River in the town of Braintree. Granted June 20, 1898.

2151. Petition of the city of Fall River for license to extend into Taunton River its sewer now discharging at the westerly end of Ferry Street in said city. Granted June 22, 1898.

2152. Petition of the city of Fall River for license to extend into Taunton River its sewer now discharging at the westerly end of Cove Street in said city. Granted June 22, 1898.

2153. Petition of the city of Fall River for license to extend into Taunton River its sewer now discharging near the westerly end of Brightman Street in said city. Granted June 22, 1898.

2154. Petition of James E. Rothwell for license to build a wharf in Cotuit harbor in the town of Barnstable. Granted June 22, 1898.

2155. Petition of Charles C. Crosby for license to build a pile bulkhead for the protection of his wharf in Nantucket harbor. Granted June 27, 1898.

2156. Petition of the city of Fall River for license to extend into Taunton River its sewer now discharging at city wharf in said city. Granted July 5, 1898.

2157. Petition of Jerome C. Borden for license to widen his wharf by building sea walls and filling solid in Taunton River in the city of Fall River. Granted July 5, 1898.

2158. Petition of the Boston Electric Light Company for approval of plans for laying a conduit for electric wires across Fort Point Channel at Congress Street bridge in the city of Boston, under authority of chapter 249 of the Acts of 1898. Granted July 13, 1898.

2159. Petition of the Boston Electric Light Company for approval of plans for laying a conduit for electric wires across the draw-way in L Street bridge on the reserved channel, at South Boston, under authority of chapter 249 of the Acts of 1898. Granted July 13, 1898.

Nos.

2160. Petition of Thomas A. Watson for license to build bulk heads, fill solid, and to dredge, in Weymouth For River in the town of Braintree. Granted July 1 1898.

2161. Petition of the city of Springfield for license to build sewer outlet in Connecticut River in said city. Grante July 19, 1898.

2162. Petition of the New England Gas and Coke Company f license to build bulkheads and fill solid in Mystic Riv in the city of Everett. Granted July 19, 1898.

2163. Petition of the Boston Wharf Company for license to bu a sea wall, fill solid, and rebuild its pile platform, Fort Point Channel at South Boston. Granted July 2 1898.

2164. Petition of Annie Looney for license to fill solid and build and maintain structures in Great Herring Pond in the town of Plymouth. Granted July 27, 1898.

2165. Petition of Elizabeth Reed for license to build a pile pie in Lewis Bay at Hyannis in the town of Barnstable. Granted Aug. 3, 1898.

2166. Petition of Augustus P. Loring for license to extend pier, on piles, in Chelsea Creek at East Boston. Granted Aug. 3, 1898.

2167. Petition of Ivers P. Lawrence for license to build a ston and timber wharf in Lake Whalom in the town o Lunenburg. Granted Aug. 3, 1898.

2168. Petition of the Cambridge Bridge Commissioners fo approval of plans for building a temporary pile bridg across Charles River between Boston and Cambridge, a authorized by chapter 467 of the Acts of 1898. Grante Aug. 3, 1898.

2169. Petition of the Whittier Machine Company for licens to build a bulkhead, drive piles and fill solid, in For Point Channel at South Boston. Granted Aug. 16 1898.

2170. Petition of the city of Boston for license to locate an maintain a bath-house in Charles River on the westerl side of Harvard bridge. Granted Aug. 16, 1898.

2171. Petition of the Metropolitan Water Board for approval o plans for driving piles, constructing a fender-guard an laying a line of cast-iron pipe across Saugus River north westerly of and adjoining Fox bridge, in the city o Lynn and town of Saugus, as authorized by chapter 48 of the Acts of 1895. Granted Aug. 29, 1898.

Nos.

2172. Petition of the American Telephone and Telegraph Company of Massachusetts for license to drive piles in Fort Point Channel for the support of poles and wires at Federal Street bridge in the city of Boston. Granted Sept. 9, 1898.

2173. Petition of Joseph Eigner for license to build a timber wharf and fill solid in Merrimac River in the city of Haverhill. Granted Sept. 9, 1898.

2174. Petition of the Springfield Street Railway Company for license to build and maintain a system of suction and discharge pipes and protective works in Connecticut River in the city of Springfield. Granted Sept. 13, 1898.

2175. Petition of J. J. E. Rothery for license to build and maintain two bath-houses in Buzzards Bay at Cataumet in the town of Bourne. Granted Sept. 13, 1898.

2176. Petition of the Boston & Albany Railroad Company for license to build a pile pier in its Dock No. 8 in Boston harbor at East Boston. Granted Sept. 13, 1898.

2177. Petition of the county commissioners for the county of Essex for approval of plans for widening Lafayette Street in the city of Salem, over Forest River between said city and the town of Marblehead, and for rebuilding the bridge over said river and approaches thereto in Salem and Marblehead, as authorized by chapter 552 of the Acts of 1898. Granted Sept. 14, 1898.

2178. Petition of the Standard Rope and Twine Company for license to build a brick chamber and lay an iron pipe in Charles River at Brighton in the city of Boston. Granted Sept. 14, 1898.

2179. Petition of the Boston Wharf Company for license to drive piles in Fort Point Channel at its premises known as the Atlas Stores in South Boston. Granted Sept. 15, 1898.

2180. Petition of the Boston Electric Light Company for license to build a pile wharf and dredge a channel in Boston harbor near the reserved channel in South Boston. Granted Sept. 15, 1898.

2181. Petition of the Boston Electric Light Company for license to build a sea wall, bulkhead and pile wharf, and to fill solid, in Boston harbor near the reserved channel in South Boston. Granted Sept. 15, 1898.

2182. Petition of Thomas W. Carter for license to build sea walls, bulkheads and a pile platform, fill solid and construct a dock, on Neponset River easterly of Granite bridge in the town of Milton. Granted Sept. 27, 1898.

Nos.

2183. Petition of the trustees of the Toby Club for license build and maintain a pile wharf, boat-shops, ways an landing float in Buzzards Bay at Monument Beach the town of Bourne. Granted Sept. 27, 1898.

2184. Petition of George F. Chapin, agent for the owners, license to build a sea wall and fill solid in Charles Ri at Charlestown in the city of Boston. Granted Oct 1898.

2185. Petition of Frederick C. Cross for license to build maintain a stone and earth wharf and a landing stag Lake Whalom in the town of Lunenburg. Gran Oct. 4, 1898.

2186. Petition of the Quincy & Boston Street Railway Comp for license to build a sea wall, fill solid and dredge Weymouth Fore River in the city of Quincy. Gran Oct. 4, 1898.

2187. Petition of Luther T. Harrington for license to build a pier in Crystal Bay in the town of Winthrop. Gran Oct. 11, 1898.

2188. Petition of the Board of Metropolitan Park Commissio for license to build a culvert and tide gate and fill s in Sales Creek in the town of Revere. Granted Oct. 1898.

2189. Petition of the East Taunton Street Railway Company license to drive piles and build a timber structur Taunton Great River at Neck of Land bridge in the of Taunton. Granted Oct. 20, 1898.

2190. Petition of John S. Bleakie for license to fill solid maintain a float stage in Quisset harbor in the town Falmouth. Granted Oct. 26, 1898.

2191. Petition of Charles H. Eldred for license to build maintain a pile pier and float stage in Quisset harbo the town of Falmouth. Granted Oct. 26, 1898.

2192. Petition of Orlando E. Lewis for license to build bulkhe fill solid and dredge, in Crystal Cove in the tow Winthrop. Granted Oct. 26, 1898.

2193. Petition of the Boston, Revere Beach & Lynn Railr Company for license to construct dolphins in Bos harbor at East Boston. Granted Nov. 7, 1898.

2194. Petition of W. S. & J. T. Spaulding for license build and maintain a pile pier and a float stage Salem harbor in the city of Beverly. Granted Nov 1898.

Nos.

2195. Petition of the Quincy & Boston Street Railway Company for license to build a pile structure in Neponset River adjoining Neponset Avenue in the city of Boston. Granted Nov. 8, 1898.

2196. Petition of Marie N. Evans for license to build walls and fill solid in Beverly Cove in the city of Beverly. Granted Nov. 14, 1898.

2197. Petition of the Union Freight Railroad Company for license to dump snow and ice into Charles River. Granted Nov. 17, 1898.

2198. Petition of the Boston Elevated Railway Company for license to dump snow and ice from bridges into tide waters. Granted Nov. 17, 1898.

2199. Petition of the city of Boston for license to dump snow and ice into tide waters. Granted Nov. 29, 1898.

Miscellaneous Permits granted during the Year.

New York, New Haven & Hartford Railroad Company, to dredge in the dock on the westerly side of its wharf in Hyannis harbor, and dump the dredged material off Point Gammon. Granted Dec. 10, 1897.

New England Telephone and Telegraph Company of Massachusetts, to place ten poles for the support of wires on land of the Commonwealth at South Boston. Granted Dec. 31, 1897.

Patrick Galvin, to use a portion of the South Boston flats. Granted Dec. 31, 1897.

George E. Bates, to remove gravel from Ocean Beach between U and V streets in Hull. Granted Dec. 31, 1897.

T. F. Meany & Sons, to use a portion of the South Boston flats for storage purposes. Granted Dec. 31, 1897.

A. A. Elston & Co., to dump snow from Federal Street bridge in the city of Boston into tide water. Granted Feb. 2, 1898.

Isaac Blair & Co., to dump snow from Dover Street bridge in the city of Boston into tide water. Granted Feb. 2, 1898.

Peter McConarty, to use a portion of the South Boston flats for storage purposes. Granted Feb. 10, 1898.

Boston Asylum and Farm School for Indigent Boys, to remove gravel from a bar at Thompson's Island in Boston harbor. Granted Feb. 10, 1898.

Eastern Dredging Company, to dredge material from the bed of Charles River between Western Avenue bridge and Arsenal Street bridge, for use in filling lands adjacent to said river for parkway purposes. Granted March 3, 1898.

Joseph L. Boardman, to remove gravel from a portion of Salter's Beach, in Plymouth. Granted March 9, 1898.

William Minot, to deposit material dredged by him in the construction of a boat harbor at Bourne's Cove in the town of Wareham, westerly of and adjoining the westerly bulkhead to be built under license from the Board dated Jan. 31, 1898. Granted March 28, 1898.

Perkins, White & Co., to dredge in Shirley Gut, Boston harbor, between Point Shirley and Deer Island. Granted March 28, 1898.

New England Telephone and Telegraph Company of Massachusetts, to place a pole on land of the Commonwealth at South Boston. Granted March 31, 1898.

Cunningham Iron Company, to connect a drain with the Commonwealth's sewer in Fargo Street at South Boston. Granted March 31, 1898.

Cunningham Iron Company, to connect a pipe with the drain from its office building in South Boston, in addition to the authority granted by permit from the Board dated March 31, 1898. Granted April 8, 1898.

City of Boston, to build a temporary pile and timber bulkhead in Charles River at the Back Bay Fens, northerly of Beacon Street in the city of Boston. Granted April 8, 1898.

H. W. Huguley, to remove gravel and sand from the beach in front of his upland in the town of Marblehead. Granted April 20, 1898.

Nolan Brothers, to use a portion of the South Boston flats for storage purposes. Granted April 21, 1898.

Gilbert & Barker Manufacturing Company, to use a portion of the South Boston flats for storage purposes. Granted May 17, 1898.

City of Boston, to locate and build wing walls to the stone abutments of Summer Street extension at C Street, on land of the Commonwealth. Granted May 17, 1898.

Bay State Dredging Company, to dredge material from the bed of Mystic River, between the extreme low water lines on either side of said river, for use in filling at Charlestown Park on said river. Granted May 31, 1898.

Boston & Maine Railroad, to publish notice, in the name of the Board, of the closing of Mystic River to the passage of vessels through the draw in its western division bridge on said river, from June 15, 1898, to July 6, 1898, for the purpose of making necessary repairs to said bridge. Granted June 7, 1898.

New York, New Haven & Hartford Railroad Company, to publish notice, in the name of the Board, of the closing of Fort Point Channel to the passage of vessels through the draw in the Old Colony Railroad bridge across said channel for the purpose of making necessary repairs to said bridge. Granted June 9, 1898.

Town of Marblehead, to remove material from beaches in said town. Granted June 20, 1898.

Boston & Maine Railroad, to publish notice, in the name of the Board, of the closing of Mystic River to the passage of vessels through the draw in its western division bridge on said river, from July 11, 1898, to July 31, 1898, for the purpose of making necessary repairs to said bridge. Granted July 11, 1898.

Cole Brothers, to dump dredged material in New Bedford harbor south-westerly of Sconticut Neck and within lines drawn from Mosher Ledge to Black Rock, to Henrietta Rock, to Mosher Ledge. Granted July 11, 1898.

Boston Electric Light Company, to construct and maintain conduits and man-holes in B Street and Fargo Street on the South Boston flats. Granted July 21, 1898.

Town of Hull, to remove gravel and sand from Ocean beach between Point Allerton and Strawberry Hill in said town. Granted July 25, 1898.

Marblehead Cemetery Committee, to remove stones from the beach on the north-easterly side of Marblehead Neck, known as Ballast beach or Long beach. Granted Sept. 26, 1898.

Laurence P. Howard, to remove sand from the flats in Pines River north-westerly of and near the bridge at Broadway in Revere. Granted Sept. 27, 1898.

Eastern Dredging Company, to dredge material from the bed of Charles River between Arsenal Street bridge and North Beacon Street bridge, for use in filling land adjacent to said river for parkway purposes. Granted Oct. 3, 1898.

William H. Boardman, to remove gravel from the beach opposite the Centennial House in the town of Scituate. Granted Oct. 5, 1898.

H. M. Batchelder, to remove stones from Devereux beach in the town of Marblehead. Granted Oct. 6, 1898.

Boston Electric Light Company, to publish notice, in the name of the Board, of the closing of Fort Point Channel to the passage of vessels through the draw in Congress Street bridge, for the purpose of laying a conduit for electric wires under the draw-ways and draw-pier of said bridge. Granted Oct. 19, 1898.

E. G. Knight, to remove gravel and sand from Ocean beach between Point Allerton and Strawberry Hill, in Hull. Granted Nov. 25, 1898.

Isaac Blair & Co., to dump snow from Dover Street bridge into tide water. Granted Nov. 28, 1898.

Harbor Compensation Fund.

There was paid into the treasury of the Commonwealth during the year, under sections 14 and 16 of chapter 19, Public Statutes, and chapter 146, Acts of 1897, in payment for tide water displaced by work done under licenses granted by the Board, and for rights and privileges granted in tide waters and great ponds, the sum of $18,828.45, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1898, was $253,883.64; the income from this fund on the same date was $27,379.33.

Commonwealth's Flats Improvement Fund.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1897, was $106,165.31. To this has been added during the year $3,139.46 from the income of the fund and $2,688.33 from sales and rents of lands and from other sources, making a total of $111,993.10. Of this sum there has been expended during the year $2,336.83, leaving an available balance on Nov. 30, 1898, of $109,656.27.

SALARIES OF COMMISSIONERS.

It is respectfully submitted that the salaries of this commission be raised to an equality with Boards the proper performance of whose functions and duties requires no greater time nor ability than is demanded from the members of this Board.

The foregoing report is respectfully submitted.

WOODWARD EMERY,
CLINTON WHITE,
CHARLES C. DOTEN,
Commissioners.

DEC. 1, 1898.

APPENDIX.

APPENDIX.

[A.]

[See page 5 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT MADE THIS TWENTY-FOURTH DAY OF DECEMBER IN THE YEAR EIGHTEEN HUNDRED AND NINETY-SEVEN, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND THE NEW ENGLAND DREDGING COMPANY, A CORPORATION ESTABLISHED UNDER THE LAWS OF THE COMMONWEALTH OF MASSACHUSETTS, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The contractor hereby covenants and agrees with the Commonwealth to do and complete all the work necessary and proper to widen by dredging the temporary entrance to the Reserved Channel on the South Boston Flats lying between Lawley's Yacht Basin and the main ship channel of the harbor, all the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein shall mean the Engineer of the Board of Harbor and Land Commissioners acting directly or through his properly authorized agents, such agents acting within the scope of the particular duties intrusted to them.

Specifications.

The contractor is to furnish all the plant, tools, appliances and labor necessary to do the work contracted for, as follows: —

The area to be dredged is about 50 feet wide and 1,750 feet long on the northerly side of the temporary entrance to the Reserved Channel on the South Boston Flats, and extends from the intersection of the temporary entrance with the main portion of the Reserved Channel opposite Lawley's Yacht Basin north-easterly towards the main ship channel of the harbor. The location and

dimensions of the area are more exactly shown on a plan on file in the office of the Board of Harbor and Land Commissioners, signed by Frank W. Hodgdon, Engineer, and entitled "Plan for widening the temporary entrance to the Reserved Channel, South Boston Flats, November, 1897. Scale $\frac{1}{1000}$." Said plan is referred to and made a part of these specifications.

The amount of material to be dredged from the above described area between the present bottom and the plane of 12 feet below mean low water, together with the required side slope, is 32,000 cubic yards.

The least present depth of water on the area is about 2.3 feet at mean low water, and the average cut is about 6.2 feet.

The bank at the north-westerly edge of the above described area to be sloped off sufficiently to maintain the required depth over the whole of said area, and any ridge found between the existing channel and the portion to be excavated under this contract to be removed. No extra payment or allowance to be made for such work, nor for any excavation below the required depth. In addition to the above, an amount of material not exceeding 800 cubic yards, scow measurement, to be excavated from the present temporary entrance at such places and to such depths as may be directed by the engineer.

All the work to be done so that upon the completion of the contract the channel shall be 200 feet wide on its bottom and not less than 12 feet deep at mean low water, with the required slopes on each side, from the bend at Lawley's Yacht Basin to the main ship channel.

The material excavated may be dumped on the portion of the South Boston Flats lying easterly of the filled portion of the flats northerly of a line in extension of a line parallel with and 50 feet northerly of the sea-wall on the northerly side of the Reserved Channel and south-westerly of a line in extension of a line 25 feet south-westerly of the north-westerly bulkhead at such places within said area, and in such manner, as may be prescribed from time to time by the engineer. Two or more piles to be driven and maintained by the contractor upon each of the northerly and southerly limits of the dumping area to mark them during the progress of the work, and to be removed by him upon the completion of the work, if required by the Engineer. If the contractor prefers, the material may be dumped in deep water east of a line drawn straight between Egg Rock and Minot's Light, or such other disposition may be made of the material as shall be approved by said Board.

All ledges and bowlders which may be found, and which can be removed by dredging, to be removed as part of the contract with-

out extra payment or allowance; but if any ledges or bowlders are found which cannot be removed by dredging, the covering material to be dredged away and the ledges and bowlders left bare to the depth aforesaid, and the Engineer to be the sole judge to determine whether any ledge or bowlder can be removed by dredging or not.

The aforesaid plan and the surveys with the calculations based thereon are believed to be correct, but the contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein.

In all questions which may arise concerning measurements, lines and grades, the decision of the Engineer to be final. All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the contractor at his own expense, and the marks given shall be carefully preserved.

Convenient facilities for the inspection of the work to be furnished by the contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board, and not otherwise.

The work to be commenced as soon as practicable, and to be prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the first day of June, 1898.

Estimates to be made by the Engineer of the amount of work done up to the end of each calendar month, and payment to be made thereon of 75 per centum of the proportional part of the contract price applicable to such work, as computed by the Engineer; the remaining 25 per centum to be paid upon the final completion and acceptance of the whole work.

In all operations connected with the work, the contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work; and in the employment of mechanics and laborers upon the work herein contracted for, preference shall be given by the contractor to citizens of the United States.

The contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or to any act, omission or neglect of the contractor or his employees therein.

If the work to be done under this contract shall be abandoned by the contractor, or if the Engineer at any time shall be of opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the contractor is violating any of the provisions of this contract, said Board may notify the contractor to discontinue the work and the contractor shall thereupon discontinue said work, and the Commonwealth may thereupon complete the work by contract or otherwise, and may pay the expense of the same so far as may be out of any moneys then due or to become due the contractor under this contract. In case such expense is less than the sum which would have been payable under this contract if the same had been completed by the contractor, the contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the contractor shall pay the amount of such excess to the Commonwealth.

And the Commonwealth of Massachusetts, in consideration of the performance and completion by the contractor of all of said work in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the contractor the sum of Seven Thousand Eight hundred and Fifty Dollars ($7,850) for widening the temporary entrance to the Reserved Channel, and Twenty-six cents per cubic yard, scow measurement, for material dredged as aforesaid from the present entrance channel, the same to be in full therefor, and to be paid at the times and in the manner and upon the terms and conditions hereinbefore set forth.

In Witness Whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be signed and delivered in its name and behalf, and the seal of the Commonwealth to be hereto affixed, and has also caused these presents to be approved by the Governor and Council; and the said New

England Dredging Company, by Charles H. Souther its President, thereto duly authorized, has caused these presents to be signed and delivered in its name and behalf and its corporate seal to be hereunto affixed.

THE COMMONWEALTH OF MASSACHUSETTS,

By WOODWARD EMERY, } *Harbor and Land*
CLINTON WHITE, } *Commissioners.*

NEW ENGLAND DREDGING COMPANY,

By CHARLES H. SOUTHER, *President.*

[SEAL OF N. E. DREDGING CO.]

COMMONWEALTH OF MASSACHUSETTS.

In Council, Dec. 29, 1897.

EDWARD F. HAMLIN,
Executive Clerk.

Witness the Seal of the Commonwealth:

WM. M. OLIN,
Secretary of the Commonwealth.

[SEAL OF THE COMMONWEALTH.]

[B.]

[See page 13 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS THIRD DAY OF OCTOBER IN THE YEAR EIGHTEEN HUNDRED AND NINETY-EIGHT, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS, WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND SIMON HESS OF THE CITY, COUNTY AND STATE OF NEW YORK, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The Contractor hereby covenants and agrees with the Commonwealth to do and complete all the work required by the Board of Harbor and Land Commissioners in order to widen, deepen and extend the channel on the westerly side of South Bay in the city of Boston in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein shall mean the Engineer of the Board of Harbor and Land Commissioners acting either directly or through his authorized agents, within the scope of the particular duties intrusted to them.

Specifications.

The Contractor is to furnish all the plant, tools, appliances and labor necessary and proper for the work under contract.

The channel to be dredged extends from Dover Street bridge along the westerly and southerly sides of South Bay to a point about 980 feet westerly of the tracks of the New England Railroad Company. The westerly and southerly side lines except for the section nearest Dover Street bridge are parallel with and 50 feet distant from the Harbor Line.

The location and extent of the channel are more exactly shown on a plan on file in the office of the Board of Harbor and Land Commissioners, entitled, "Plan of channel to be dredged in South Bay, Boston Harbor, September, 1898, Scale $\frac{1}{1000}$," and signed by Frank W. Hodgdon, Engineer. Said plan is referred to and made a part of these specifications.

The channel is to be about 3,670 feet long and is to be excavated to the depth of 12 feet below mean low water, with a width at that grade of 110 feet, the banks at its sides to be sloped at an inclination of 2 to 1 outside of said width of 110 feet. In addition to the above, the salient angle on the easterly side of the channel near Burnham's coal wharf is to be dredged to the depth of 12 feet below mean low water to lines shown on said plan.

The amount of material to be removed in excavating the channel to the lines and depths above described is estimated at 114,000 cubic yards. The average cut is about 6 feet.

The above-described channel is to be excavated so that it will have upon the completion of the work the width, depth and side slopes above described. No extra payment or allowance will be made for any excavation below or outside of the required lines and grades. The material excavated is to be deposited, under the direction and to the satisfaction of the Board, on the land and flats in and adjacent to said South Bay and inside the Harbor Lines, up to the level of 13 feet above mean low water; or such other disposition may be made of the material as shall be approved by said Board.

All ledges and bowlders which may be found, and which can be removed by dredging, to be removed as part of the contract without extra payment or allowance; but if any ledges or bowlders are found which cannot be removed by dredging, the covering material to be dredged away and the ledges and bowlders left bare to the depth aforesaid. The Engineer is to be the sole judge to determine whether any ledge or bowlder can be removed by dredging or not.

The aforesaid plan, and the surveys and calculations based thereon, are believed to be correct; but the Contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein.

In all questions which may arise concerning measurements, lines and grades, or of interference with other work or contractors, the decision of the Engineer to be final. All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the Contractor at his own expense, and the marks given shall be carefully preserved.

Convenient facilities for the inspection of the work to be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board.

The work to be commenced as soon as practicable, and to be prosecuted vigorously in all suitable weather until completion, at least 40,000 cubic yards of material to be excavated before the first day of January 1899, and the whole work to be fully completed on or before the thirtieth day of July, 1899.

Estimates to be made by the Engineer of the amount of work done up to the end of each calendar month, and payment to be made thereon of 75 per centum of the proportional part of the contract price applicable to such work, as computed by the Engineer; the remaining 25 per centum to be paid upon the final completion and acceptance of the whole work.

In all operations connected with the work, the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work, and in the employment of mechanics and laborers in the construction of the work herein contracted for preference shall be given by the Contractor to citizens of the United States.

The Contractor shall bear all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the Contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or to any act, omission or neglect of the Contractor or his employees therein. In no event whatever shall the Contractor be entitled to any compensation from the Commissioners, their servants or agents, on account of any acts or omissions under or growing out of this contract.

If the work to be done under this contract shall be abandoned by the Contractor, or if the Engineer at any time shall be of the opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work and the Contractor

shall thereupon discontinue said work and the Commonwealth may thereupon complete the work by contract or otherwise, and may pay the expense of the same so far as may be out of any moneys then due or to become due the Contractor under this contract. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the Contractor shall pay the amount of such excess to the Commonwealth.

And when the Contractor has performed said work in the manner and in accordance with the terms and conditions aforesaid, the Commonwealth of Massachusetts will pay the Contractor the sum of twenty-nine thousand nine hundred and ninety (29,990) dollars in full therefor, at the times and in the manner and upon the terms and conditions hereinbefore set forth.

In Witness Whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be executed and delivered under the seal of the Commonwealth with the approval of the Governor and Council; and the said Simon Hess has signed and sealed the same on this third day of October eighteen hundred and ninety-eight.

THE COMMONWEALTH OF MASSACHUSETTS,

By Woodward Emery,
Clinton White,
Chas. C. Doten,
} *Harbor and Land Commissioners.*

[Seal.] SIMON HESS.

Commonwealth of Massachusetts.

In Council, Oct. 5, 1898.
Approved:

E. F. Hamlin,
Executive Secretary.

Witness the seal of the Commonwealth:

Wm. M. Olin,
Secretary of the Commonwealth.

[Seal of the Commonwealth.]

[C.]

[See page 15 of this report, *ante*.]

VOTES OF THE BOARD OF HARBOR AND LAND COMMISSIONERS, OCT. 27, 1898.

WHEREAS the Board is authorized under St. 1897, c. 486, to take from time to time, for the purposes stated in said act, such portions of certain land, flats, and rights therein, on the easterly side of East Boston, described in said act, as it may deem necessary, and to provide certain public improvements as set forth in said act;

AND WHEREAS the Board has considered the takings and improvements authorized by said act, and has decided upon and adopted a general scheme or plan to be carried out by it under the authority of said act;

VOTED: That the plan now before the Board, marked "Commonwealth of Massachusetts, Harbor and Land Commissioners' Office. Plan embodying the scheme of public improvement contemplated and adopted October 27, 1898, by the Board of Harbor and Land Commissioners, acting under the authority of Statutes 1897, chapter 486, and showing the land and flats at East Boston which the said Board contemplates taking in fee from time to time under said act, in furtherance and as a part of such general scheme and plan, scale 1 in.–200 ft.," dated October 26, 1898, signed by Woodward Emery, Clinton White and Charles C. Doten, constituting the Board of Harbor and Land Commissioners, and by Frank W. Hodgdon, Engineer, be and the same hereby is approved and adopted as the scheme and plan which the Board contemplates carrying out; said scheme and plan contemplating the taking by the Board under said act, absolutely in fee simple, free from all conditions and easements, subject to the approval of the Governor and Council, of that part of all that tract of land and flats not owned by the Commonwealth, and all the rights, easements, title and interest of every name and nature, of all persons and parties whatsoever, except the Commonwealth, in and to every part and parcel of said tract, which is situated on the easterly side of that

part of Boston in the County of Suffolk and Commonwealth of Massachusetts known as East Boston, said tract being shown as included within red lines on said plan, marked as aforesaid, and bounded and described as follows, to wit: —

Beginning at a stake in the southwesterly side line of Maverick Street, in said East Boston, extended on a straight line in a southeasterly direction at a point distant five hundred and sixty and four-tenths (560.4) feet southeasterly, measuring along said side line extended as aforesaid, from the intersection of said last named side line with the southeasterly side line of Jeffries Street, in said East Boston, as shown on the plan hereinafter referred to; thence north 30° 23′ 18″ east fifty (50) feet to a stake in the northeasterly side line of said Maverick Street extended on a straight line in a southeasterly direction; thence turning and running by said last mentioned side line extended as aforesaid north 59° 36′ 42″ west three hundred and ten and four-tenths (310.4) feet to a stake in said last mentioned side line, at land supposed to belong to the estate of Ireneus Gooding, deceased; thence turning and running north 33° 08′ 11″ east by said land supposed to belong to the estate of Ireneus Gooding, deceased, five hundred and six-tenths (500.6) feet to a point in a corner of said land; thence turning and running north 59° 36′ 42″ west twenty-two and six-tenths (22.6) feet to a stake at land supposed to be of the East Boston Company; thence turning and running north 44° 09′ 30″ east through said land supposed to be of said Company, and in part through land of the Commonwealth, twenty-two hundred and seventy-six and nine-tenths (2276.9) feet on a line parallel with and fifteen hundred (1500) feet distant northwesterly from the United States Pierhead Line approved by the Secretary of War June 2, 1890, to a point in the division line between land supposed to be of the East Boston Company and land of the city of Boston; thence turning and running south 49° 14′ 24″ east, on said land of the city of Boston and in part on land of the Commonwealth, eight hundred and twenty (820) feet to a stake; thence turning and running north 87° 58′ 57″ east nine hundred and eighty-four and one-tenth (984.1) feet to a point in the said United States Pierhead Line; thence turning and running south 29° 35′ east about forty-two hundred and forty-four (4244) feet to a point in the thread of the channel in Boston Harbor known as Apple Island Channel, as it now exists; thence turning and running westerly, southwesterly and northwesterly, by the thread of said Apple Island Channel and the channel between Bird Island Flats and Noddles Island Flats, as said channels now exist, and as the same wind and turn, about four thousand five hundred (4,500)

feet to a point in the thread of said last named channel, as it now exists, distant southeasterly in a straight line six hundred and fifty (650) feet from an angle in the said Pierhead Line located in the last named channel, as it now exists, and in the prolongation southeasterly, on a straight line, of the northeasterly side line of Everett Street in East Boston; thence turning and running in a northwesterly direction, in a straight line, six hundred and fifty (650) feet to the said angle in said Pierhead Line; thence turning and running north 79° 59′ 07″ west by the said Pierhead Line six hundred and ninety-four and one-tenth (694.1) feet to a point in said line; thence turning at a right angle and running north 10° 0′ 53″ east about four hundred and forty-five (445) feet to a point in the southwesterly line of the lot marked "27" on said plan, being land now or late of Frank H. Hamblin; thence turning and running in a northwesterly direction, in a straight line, by said southwesterly line of said lot 27, about two hundred and forty-five (245) feet to the point of beginning.

It is also Voted that the original of the plan aforesaid be kept on file in the official archives of this Board.

These votes, being carefully read over by the Board and a comparison made with the plan, were put and carried unanimously. The Board signed the plan referred to in the above votes.

THE TAKING.

COMMONWEALTH OF MASSACHUSETTS.

In Board of Harbor and Land Commissioners,

at its regular meeting, held this twenty-eighth day of October, 1898, it was unanimously voted:

That whereas, the undersigned Woodward Emery, Clinton White and Charles C. Doten, having been duly appointed and qualified according to the provisions of the laws of the Commonwealth of Massachusetts, do now constitute the Board known as the "Board of Harbor and Land Commissioners;" and

Whereas, by Chapter 486 of the Acts passed by the General Court of said Commonwealth in the year 1897, entitled "An Act to secure public ownership and control of certain portions of the foreshore of Boston Harbor," said Board was authorized to take the land, flats and rights hereinafter described;

Now, therefore, we, the said Board of Harbor and Land Commissioners, acting for the said Commonwealth of Massachusetts, by virtue of and in the exercise and partial execution of the power and authority given us by said Act, and of any and every other

power and authority us hereto in any wise enabling, and for the purposes authorized by said Act, have adjudged and do hereby adjudge the following described land, flats and rights to be necessary to carry out the purposes of said Act, and have taken and do hereby take absolutely in fee simple, free from all conditions and easements, in the name and behalf of said Commonwealth and with the approval of the Governor and Council, all that tract of land and flats and all the rights, easements, title and interest of every name and nature of all persons and parties whatsoever in and to every part and parcel of said tract which is situated on the easterly side of that part of Boston in the County of Suffolk and said Commonwealth, known as East Boston, and bounded and described as follows, to wit: —

Beginning at a stake in the southwesterly side line of Maverick Street, in said East Boston, extended on a straight line in a southeasterly direction at a point distant five hundred and sixty and four-tenths (560.4) feet southeasterly, measuring along said side line extended as aforesaid, from the intersection of said last named side line with the southeasterly side line of Jeffries Street, in said East Boston, as shown on the plan hereinafter referred to; thence north 30° 23′ 18″ east fifty (50) feet to a stake in the northeasterly side line of said Maverick Street extended on a straight line in a southeasterly direction; thence turning and running by said last mentioned side line extended as aforesaid north 59° 36′ 42″ west three hundred and ten and four-tenths (310.4) feet to a stake in said last mentioned side line, at land supposed to belong to the estate of Ireneus Gooding, deceased, thence turning and running north 33° 8′ 11″ east by said land supposed to belong to the estate of Ireneus Gooding, deceased, five hundred and six-tenths (500.6) feet to a point in a corner of said land; thence turning and running north 59° 36′ 42″ west twenty-two and six-tenths (22.6) feet to a stake at land supposed to be of The East Boston Company, thence turning and running north 44° 09′ 30″ east through said land supposed to be of said Company and in part through land of the Commonwealth twenty-two hundred and seventy-six and nine-tenths (2276.9) feet on a line parallel with and fifteen hundred (1500) feet distant northwesterly from the United States Pierhead Line approved by the Secretary of War June 2, 1890, to a point in the division line between land supposed to be of the East Boston Company and land of the City of Boston; thence turning and running south 49° 14′ 24″ east, on said land of the City of Boston and in part on land of the Commonwealth, eight hundred and twenty (820) feet to a stake; thence turning and running north 87° 58′ 57″ east, nine hundred and eighty-four and one-tenth (984.1) feet to a point in the said United States Pierhead Line; thence turning

and running south 44° 09′ 30″ west by said Pierhead Line three thousand four hundred and forty-six (3,446) feet to a point at an angle in said Line in the channel between Bird Island Flats and Noddles Island Flats as it now exists; thence turning and running north 79° 59′ 07″ west by the said Pierhead Line six hundred and ninety-four and one-tenth (694.1) feet, to a point in said line; thence turning at a right angle and running north 10° 00′ 53″ east about four hundred and forty-five (445) feet to a point in the southwesterly line of the lot marked "27" on said plan, being land now or late of Frank H. Hamblin; thence turning and running in a northwesterly direction in a straight line by said southwesterly line of said lot twenty-seven about two hundred and forty-five (245) feet to the point of beginning; comprising lands taken from the estates of Moses Kimball and David Kimball, deceased, The East Boston Company, William G. Jenkins, Julia A. S. Wainwright, Charlotte A. Green, Isabella G. Walker, Thomas J. Hunt, John Lane, Frank H. Hamblin, and James H. Stark and Frederick J. Stark, trustees; but all names of owners herein stated, although believed to be correct, are given only as matters of information and belief.

Said premises are shown as included within red lines on a plan entitled "Commonwealth of Massachusetts, Harbor and Land Commissioners' Office. Plan of flats at East Boston within the United States Pierhead Line, taken by the Board of Harbor and Land Commissioners under Statutes 1897, Chapter 486," of even date herewith, signed by said Commissioners and by Frank W. Hodgdon, Engineer of Board, and to be recorded herewith.

All the foregoing described lands and flats and all the rights of all persons therein or included in the above description are taken under the provisions of chapter 486 of the Acts of 1897 in the name and behalf of the Commonwealth.

Witness the hands of the Board of Harbor and Land Commissioners, acting for and in behalf of the Commonwealth of Massachusetts, this twenty-eighth day of October in the year of our Lord one thousand eight hundred and ninety eight.

WOODWARD EMERY,
CLINTON WHITE,
CHAS. C. DOTEN,
} *Board of Harbor and Land Commissioners.*

COMMONWEALTH OF MASSACHUSETTS.

Executive Department, Council Chamber, November 2, A.D. 1898.

To all to whom these Presents shall come:

Know ye that whereas the Board of Harbor and Land Commissioners, duly established under the laws of the Commonwealth

of Massachusetts, and acting under the authority of Chapter 486 of the acts of the year 1897, has taken, with the approval of us, the Governor and Council of the Commonwealth of Massachusetts, for the purposes defined in said act, certain real estate referred to or described in the taking to which this instrument is annexed, dated October 28, 1898, these presents being hereby made a part thereof, which real estate lies in that part of Boston in the County of Suffolk and said Commonwealth known as East Boston, and is shown upon a plan marked "Commonwealth of Massachusetts, Harbor and Land Commissioners' Office. Plan of flats at East Boston within the United States Pierhead Line taken by the Board of Harbor and Land Commissioners under St. 1897, c. 486," dated October 28th, 1898, signed by Woodward Emery, Clinton White and Charles C. Doten, constituting said Board, and by Frank W. Hodgdon, Engineer, which plan is to be recorded herewith.

NOW, THEREFORE, We, Roger Wolcott, Governor of said Commonwealth, and W. Murray Crane, Lieutenant Governor, Nathaniel F. Ryder, Benjamin S. Lovell, George N. Swallow, John H. Sullivan, Horace H. Atherton, Elisha H. Shaw, Allen L. Joslin and William B. Plunkett, members of the Council of said Commonwealth, in pursuance of section three of said chapter 486 of the acts of the year 1897, hereby certify that we approve said taking and every act, matter and thing connected therewith.

IN WITNESS WHEREOF, we hereby set our hands, and I, Roger Wolcott, Governor of the Commonwealth of Massachusetts, do cause the seal of said Commonwealth to be hereto affixed and these presents to be countersigned by the Secretary of State this second day of November A.D. 1898.

ROGER WOLCOTT, *Governor.*
W. MURRAY CRANE,
BENJ. S. LOVELL,
N. F. RYDER,
GEO. N. SWALLOW,
H. H. ATHERTON,
JOHN H. SULLIVAN,
ALLEN L. JOSLIN,
W. B. PLUNKETT,
ELISHA H. SHAW,
Members of the Council.

Witness the Seal of the Commonwealth.

WM. M. OLIN,
Secretary of the Commonwealth.

[SEAL OF THE COMMONWEALTH.]

[D.]

[See page 25 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS TWENTIETH DAY OF JUNE IN THE YEAR EIGHTEEN HUNDRED AND NINETY-EIGHT, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS, WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND CHARLES E. DAVIS OF NEW BEDFORD IN SAID COMMONWEALTH HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The Contractor hereby covenants and agrees with the Commonwealth to provide all the materials and to do and complete all the work necessary and proper to build two timber jetties to protect the banks of the Menamsha Inlet, and to maintain it on the boundary lines between the towns of Gay Head and Chilmark, all the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein shall mean the Engineer of the Board of Harbor and Land Commissioners acting directly or through his properly authorized agents, such agents acting within the scope of the particular duties intrusted to them.

Specifications.

The Contractor is to furnish all the plant, tools, appliances, labor and materials necessary to build and complete the jetties in the place and manner hereinafter described.

The jetties are to be located, one on each side of said Inlet, and are to extend into Vineyard Sound nearly at right angles to the general trend of the high-water line of Menamsha Bight, and to a distance of about three hundred feet therefrom, the inner ends of said jetties to extend to above high-water mark, as shown on the plan on file in the office of the Board of Harbor and Land Commissioners marked "Plan of Menamsha Inlet, showing proposed Jetties for protecting its banks, July, 1897," signed by Frank W. Hodgdon, Engineer, which shows the location, size and method of

construction of the jetties and is referred to and made a part of these specifications, and is to be followed in all details not otherwise mentioned.

If in the opinion of the Engineer, it is deemed advisable, the location of the east jetty shall be moved north-easterly a distance not exceeding 50 feet, the exact amount of such change to be prescribed in writing by the Engineer before the work on said easterly jetty is begun.

Piles and Pile-work.

All piles and spurshores to be new oak piles, sound and straight, at least 10 inches in diameter three feet from the butt, and not less than 7 inches in diameter at the small end, including bark in both cases. They are to be well shaped and of the proper length, as shown on the plan, for the position in which they are to be driven. All main piles to be cut off and capped five feet above the plane of low-water established by the Engineer, and the spurshores to be fitted two feet below the top of main piles. All piles must be free from defects of every kind (none with large knots, rotten or worm-eaten, split, peeled or partly peeled, or with loose bark, will be accepted), and must be carefully and thoroughly driven to the satisfaction of the Engineer. Any pile which may be driven in a wrong position, or which may not be long enough for capping after being driven, or which may be split in driving, shall be withdrawn and another substituted. All spurshores are to be fitted in a workmanlike manner and bolted to the piles with $1\frac{1}{4}$-inch screw bolts. At the outer end of each jetty four piles to be driven in a cluster, to be securely bolted to each other, and to the end of the bulkhead with $1\frac{1}{4}$-inch screw bolts.

Stringers.

There are to be two stringers of spruce timber running throughout the whole length of each jetty, one 6 x 10 inches, fitted and bolted to the piles with its upper edge 5 feet above low-water as above described; the other 6 x 8 inches, with its lower edge at the level of said low-water; both to be bolted to the piles with 1-inch screw bolts, one in each bearing. The stringers to be in as long lengths as possible, the joints to come between the piles, and to be spliced with pieces of the same at least 3 feet long, bolted to the stringers with $\frac{3}{4}$-inch screw bolts, four in each splice.

Planking.

The planking to be 3-inch spruce plank, set vertically, not more than one-third the number to be less than 8 inches wide, to be of

such lengths and driven to such depths as are shown on the plan, and are to be well spiked to the stringers by large sized wire spikes 7 inches long, two spikes in each bearing. They are to be still further secured to the upper stringer by a strip of plank 3 x 6 inches, placed as shown on the plan and bolted through to the upper stringer by $\frac{3}{4}$-inch screw bolts, one every six feet, with extra bolts at the joints.

Quality of Timber.

All timber used to be sound, straight grained, of full size, rectangular in section, and of even thickness, free from shakes and splits.

Bolts.

All bolts to be best, double, refined iron, and all screw bolts to have nuts and washers of such sizes as shall be approved by the Engineer.

Upon the completion of the work, the Contractor to remove from the premises all materials and refuse left from the construction, and to leave the premises in a condition satisfactory to the Engineer.

The drawings and specifications are intended to be explanatory of each other; but should any discrepancy appear, or any misunderstanding arise as to the import of anything contained in either, the explanation and determination of the Engineer shall be considered final and binding on the Contractor. Any errors or omissions in drawings or specifications may be corrected by the Engineer, such correction to govern all work only from the time that the Engineer gives due notice thereof.

In all questions which may arise concerning measurements, lines and grades, or of interference with other work or contractors, the decision of the Engineer to be final.

All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the Contractor at his own expense, and the marks given shall be carefully preserved.

Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall, on demand, be at once removed from the work.

Any unfaithful or imperfect work which may be discovered before the final acceptance of the work shall be corrected immediately and any unsatisfactory materials delivered shall be rejected on the requirement of the Engineer, notwithstanding that they may have been overlooked in previous inspection. The inspection of the work shall not relieve the Contractor of any of his obligations to perform good work, as herein prescribed; and

all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be removed, and replaced by good and satisfactory work.

Convenient facilities for the inspection of the work shall be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board.

The work to be commenced as soon as practicable and to be prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the first day of October, 1898.

In all operations connected with the work the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work, and in the employment of mechanics and laborers in the construction of the work herein contracted for, preference shall be given by the Contractor to citizens of the United States.

The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the Contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or to any act, omission or neglect of the Contractor or his employees therein.

If the work to be done under this contract shall be abandoned by the Contractor, or if the Engineer at any time shall be of the opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work and the Contractor shall thereupon discontinue said work and the Commonwealth

such lengths and driven to such depths as are shown on the plan, and are to be well spiked to the stringers by large sized wire spikes 7 inches long, two spikes in each bearing. They are to be still further secured to the upper stringer by a strip of plank 3 x 6 inches, placed as shown on the plan and bolted through to the upper stringer by $\frac{3}{4}$-inch screw bolts, one every six feet, with extra bolts at the joints.

Quality of Timber.

All timber used to be sound, straight grained, of full size, rectangular in section, and of even thickness, free from shakes and splits.

Bolts.

All bolts to be best, double, refined iron, and all screw bolts to have nuts and washers of such sizes as shall be approved by the Engineer.

Upon the completion of the work, the Contractor to remove from the premises all materials and refuse left from the construction, and to leave the premises in a condition satisfactory to the Engineer.

The drawings and specifications are intended to be explanatory of each other; but should any discrepancy appear, or any misunderstanding arise as to the import of anything contained in either, the explanation and determination of the Engineer shall be considered final and binding on the Contractor. Any errors or omissions in drawings or specifications may be corrected by the Engineer, such correction to govern all work only from the time that the Engineer gives due notice thereof.

In all questions which may arise concerning measurements, lines and grades, or of interference with other work or contractors, the decision of the Engineer to be final.

All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the Contractor at his own expense, and the marks given shall be carefully preserved.

Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall, on demand, be at once removed from the work.

Any unfaithful or imperfect work which may be discovered before the final acceptance of the work shall be corrected immediately and any unsatisfactory materials delivered shall be rejected on the requirement of the Engineer, notwithstanding that they may have been overlooked in previous inspection. The inspection of the work shall not relieve the Contractor of any of his obligations to perform good work, as herein prescribed; and

all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be removed, and replaced by good and satisfactory work.

Convenient facilities for the inspection of the work shall be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board.

The work to be commenced as soon as practicable and to be prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the first day of October, 1898.

In all operations connected with the work the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work, and in the employment of mechanics and laborers in the construction of the work herein contracted for, preference shall be given by the Contractor to citizens of the United States.

The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the Contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or to any act, omission or neglect of the Contractor or his employees therein.

If the work to be done under this contract shall be abandoned by the Contractor, or if the Engineer at any time shall be of the opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work and the Contractor shall thereupon discontinue said work and the Commonwealth

may, after the said notice, complete the work by contract or otherwise, and may pay the expense of the same as far as may be out of any moneys then due or to become due the Contractor under this contract. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the Contractor shall pay the amount of such excess to the Commonwealth.

Estimates to be made by the Engineer at the end of each calendar month of the value of the work completed in place, and payment to be made thereon of 75 per centum of the value of said work, as computed by the Engineer, the remaining 25 per centum to be paid upon the final completion and acceptance of the whole work.

And the Commonwealth of Massachusetts, in consideration of the performance and completion by the Contractor of all of said work in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the Contractor the sum of three thousand eight hundred dollars in full therefor, at the times and in the manner and upon the terms and conditions hereinbefore set forth.

IN WITNESS WHEREOF, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be executed and delivered under the seal of the Commonwealth with the approval of the Governor and Council; and the said Charles E. Davis has hereunto set his hand and seal.

CHARLES E. DAVIS.

[SEAL.]

THE COMMONWEALTH OF MASSACHUSETTS,

By WOODWARD EMERY, CLINTON WHITE, } *Harbor and Land Commissioners.*

COMMONWEALTH OF MASSACHUSETTS.

In Council, June 22, 1898.

EDWARD F. HAMLIN,
Executive Secretary.

Witness the Seal of the Commonwealth:

WM. M. OLIN,
Secretary of the Commonwealth.

[SEAL OF THE COMMONWEALTH.]

[E.]

[See page 28 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS SEVENTH DAY OF SEPTEMBER IN THE YEAR EIGHTEEN HUNDRED AND NINETY-EIGHT, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS, WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND GEORGE H. CAVANAGH OF BOSTON IN SAID COMMONWEALTH, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The Contractor hereby covenants and agrees with the Commonwealth to provide all the plant, tools, materials and labor necessary and proper to excavate a channel in the town of Barnstable from the South Bay at Osterville to Nantucket Sound, and to construct timber jetties to protect the outer entrance of said channel. All the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein shall mean the Engineer of the Board of Harbor and Land Commissioners acting directly or through his properly authorized agents, such agents acting within the scope of the particular duties intrusted to them.

Specifications.

The Contractor is to furnish all the plant, tools, appliances, labor and materials necessary and proper to excavate the channel and build the jetties and put them in condition for use as follows: —

Dredging.

The channel is to extend from Nantucket Sound through Dead Neck Beach, so called, in the town of Barnstable, at a point about 250 feet west of the westerly edge of the upland of Dead Neck and from there extends northerly into South Bay about 2,400 feet from the crest of the ridge of Dead Neck Beach.

The exact location of the channel is shown on a plan on file in the office of the Board of Harbor and Land Commissioners entitled "Plan of proposed Jetties and Channel from South Bay to Nan-

tucket Sound at Osterville, Mass., June, 1898." Said plan is referred to and made a part of these specifications.

The channel to be excavated is about 2600 feet long and is to be dredged to the depth of 3 feet below mean low water for a width of not less than 100 feet; and where the sides are not protected by the jetties, the banks outside of said width of 100 feet are to be sloped sufficiently to maintain the required depth over the full width of 100 feet. The side slopes must not in any place be less than 2 to 1.

The channel to be excavated full to the lines and grades above-described and to be maintained by the Contractor in good order until the completion of the whole work. No extra payment or allowance will be made on account of any excavation below or outside of the required lines and grades.

The amount of material to be removed between the present surface and the lines and grades of the proposed channel as calculated from the aforesaid survey and plan, assuming the side slopes to be 2 to 1, is 25,000 cubic yards.

Disposal of Dredged Material.

The excavated material to be deposited either in Nantucket Sound at such places as may be designated or approved by the Engineer, or upon such portions of the marsh or upland adjacent to or near the location of the proposed channel as may be approved by the Engineer and the owner or owners of the property. Whenever the latter method of disposing of the excavated material is adopted, provision must be made to the satisfaction of the Engineer, by dikes or otherwise, to prevent the escape of any of such material from any area upon which it has been deposited.

Jetties.

The jetties are to be located, one on each side of the outer entrance to the proposed channel, and are to extend from the inner side of the sand ridge of Dead Neck Beach southerly through the ridge and about 540 feet from the crest of said ridge into Nantucket Sound.

The exact location, dimensions and method of construction are shown in detail on the plan above referred to, which is to be followed in all details not otherwise mentioned.

Piles and Pile-work.

All piles and spurshores to be new oak piles, sound and straight, at least 10 inches in diameter three feet from the butt, and not less than 7 inches in diameter at the small end, including bark in both

cases. They are to be well shaped and of the proper length, as shown on the plan, for the position in which they are to be driven. All main piles, except at the outer end of each jetty, to be cut off and capped six feet above the plane of low water established by the Engineer, except the piles in the clump at the outer end of each jetty, which are to be cut off four feet higher, and the spurshores, which are to be fitted about 1½ feet below the top of main piles. All piles must be free from defects of every kind (none with large knots, rotten or worm-eaten, split, peeled or partly peeled, or with loose bark, will be accepted), and must be carefully and thoroughly driven, all to the satisfaction of the Engineer. Any pile which may be driven in a wrong position, or which may not be long enough for capping, after being driven, or which may be split in driving, shall be withdrawn and another substituted. All spurshores are to be fitted in a workmanlike manner and bolted to the piles with 1¼-inch screw bolts. At the outer end of each jetty 8 piles to be driven in a clump. They are to be located, driven, fitted and bolted as shown on the plan, and in addition, they are to be tied together by 80 feet of galvanized iron wire rope 2¼ inches in circumference, wrapped around the heads of the piles, as shown on the plan, and securely fastened by heavy iron staples, to the satisfaction of the Engineer. The rope to be of six strands of seven wires each, with hemp centre.

Stringers.

There are to be two stringers of spruce timber running throughout the whole length of each jetty, each 6 x 10 inches, fitted and bolted to the piles, one with its upper edge 6 feet above low-water, as above described; the other with its lower edge 6 inches above the level of said low water; both to be bolted to the piles with 1-inch screw bolts, one in each bearing. For the outer 100 feet of each jetty the stringers are to be double, with the piles alternating first one on one side and then one on the other side of the jetty. The stringers to be in as long lengths as possible, the joints to come between the piles, and to be spliced with pieces of the same at least 3 feet long, bolted to the stringers with ¾-inch screw bolts, four in each splice.

Planking.

The planking to be 4-inch spruce plank, set vertically, not more than one-third the number to be less than 8 inches wide, to be of such lengths and driven to such depths as are shown on the plan, and are to be well spiked to the stringers by large sized spikes 7 inches long, two spikes in each bearing. They are to be still further secured to the upper stringer (except for the outer 100 feet

of each jetty, where there is to be a double set of stringers), by a strip of plank 3 x 6 inches, placed as shown on the plan and bolted through to the upper stringer by ¾-inch screw bolts, one every six feet, with extra bolts at the joints.

Quality of Timber.

All timber used to be sound, straight grained, of full size, rectangular in section, and of even thickness, free from shakes and splits.

Bolts.

All bolts to be best, double refined iron, and all screw bolts to have nuts and washers of such sizes as shall be approved by the Engineer.

Plane of Reference.

The plane of mean low water referred to in these specifications is that established by the Engineer at Osterville in 1897 during the preliminary surveys for the work herein described.

General Clauses.

Upon the completion of the work, the Contractor to remove from the premises all materials and refuse left from the construction, and to leave the premises in a condition satisfactory to the Engineer.

The aforesaid plan, and the surveys and soundings, with the calculations based thereon, are believed to be correct; but the Contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein, and the Commonwealth does not guarantee them to be even approximately correct.

The drawings and specifications are intended to be explanatory of each other; but should any discrepancy appear, or any misunderstanding arise as to the import of anything contained in either, the explanation and determination of the Engineer shall be considered final and binding on the Contractor. Any errors or omissions in drawings or specifications may be corrected by the Engineer, such correction to govern all work only from the time that the Engineer gives notice in writing thereof.

In all questions which may arise concerning measurements, lines and grades, or of interference with other work or contractors, the decision of the Engineer to be final. All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the Contractor at his own expense, and the marks given shall be carefully preserved.

Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall, on demand, be at once removed from the work.

Any unfaithful or imperfect work which may be discovered before the final acceptance of the completed structure shall be corrected immediately, and any unsatisfactory materials delivered shall be rejected on the requirement of the Engineer, notwithstanding that they may have been overlooked in previous inspection. The inspection of the work shall not relieve the Contractor of any of his obligations to perform good work as herein described; and all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be removed and replaced by good and satisfactory work at the expense of the Contractor, and all completed work shall be maintained by him in good condition until the final acceptance of the whole work.

The Contractor hereby agrees to do such extra work in connection with the construction of the pier as may be ordered in writing by the Board of Harbor and Land Commissioners, and to accept in payment for the same, its reasonable cost as estimated by the Engineer, plus 15 per cent. of said estimated cost.

The Contractor to have no claim for compensation for extra work unless the same is ordered in writing by said Board, and unless the claim for the same is presented to said Board before the fifteenth day of the month following that during which each specific order is complied with.

Convenient facilities for the inspection of the work shall be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board and not otherwise.

The work to be commenced as soon as practicable and to be prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the first day of May, 1899.

In all operations connected with the work the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor

under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work, and in the employment of mechanics and laborers in the construction of the work herein contracted for preference shall be given by the Contractor to citizens of the United States.

The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the Contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or relating to any act, omission or neglect of the Contractor or his employees therein.

If the work to be done under this contract shall be abandoned by the Contractor, or if the Engineer at any time shall be of the opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work and the Contractor shall thereupon discontinue said work and the Commonwealth may, after the said notice, complete the work by contract or otherwise, and may pay the expense of the same so far as may be out of any moneys then due or to become due the Contractor under this contract. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the Contractor shall pay the amount of such excess to the Commonwealth.

The Harbor and Land Commissioners, for the Commonwealth, may retain out of any amounts due the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others for work done or materials furnished under this contract; *provided*, that notice in writing of such claims, signed by the claimants, shall have been previously filed with the Commissioners.

Estimates to be made by the Engineer at the end of each calendar month of the value of the work completed in place, and payment to be made thereon of 85 per centum of the value of said work, as computed by the Engineer, the remaining 15 per centum

to be paid upon the final completion and acceptance of the whole work, except as hereinbefore provided.

And the Commonwealth of Massachusetts, in consideration of the performance and completion by the Contractor of all of said work in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the Contractor the sum of thirteen thousand six hundred and ninety dollars ($13,690) in full therefor, at the times and in the manner and upon the terms and conditions hereinbefore set forth.

In Witness Whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be executed and delivered under the seal of the Commonwealth with the approval of the Governor and Council; and the said George H. Cavanagh has hereunto set his hand and seal.

THE COMMONWEALTH OF MASSACHUSETTS,

By Woodward Emery, Clinton White, } *Harbor and Land Commissioners.*

[seal.] GEO. H. CAVANAGH.

Commonwealth of Massachusetts.

In Council, Sept. 7, 1898.
Approved:

Edward F. Hamlin,
Executive Secretary.

Sept. 13, 1898.
Witness the Seal of the Commonwealth:

Wm. M. Olin,
Secretary of the Commonwealth.

[Seal of the Commonwealth.]

[F.]

[See page 28 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS TWENTY-SEVENTH DAY OF JUNE IN THE YEAR EIGHTEEN HUNDRED AND NINETY-EIGHT, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND NELSON L. HAYNES AND WILLIAM LAKE BOTH OF FRAMINGHAM IN SAID COMMONWEALTH DOING BUSINESS UNDER THE FIRM NAME OF HAYNES & LAKE, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The Contractor hereby covenants and agrees with the Commonwealth to do and complete all the work necessary and proper to excavate a channel through Spring Hill Beach in the town of Sandwich to form a new outlet for Scorton River, all the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein shall mean the Engineer of the Board of Harbor and Land Commissioners acting directly or through his properly authorized agents, such agents acting within the scope of the particular duties intrusted to them.

Specifications.

The Contractor is to furnish all the plant, tools, appliances and labor necessary to do the work contracted for, as follows: —

The channel is to be excavated across Spring Hill Beach in the town of Sandwich, about 4,500 feet west of the present outlet of Scorton River and substantially opposite the point where the river makes a sharp bend to the east just inside the beach. The exact location of the channel is shown on a plan on file in the office of the Board of Harbor and Land Commissioners, entitled, "Plan of Proposed New Outlet for Scorton River, Sandwich, Mass., May, 1898, Scale 1/1000." Said plan is referred to and made a part of these specifications.

The channel is to be about 1,000 feet long and 20 feet wide on the bottom, the slope of the bank on either side to be $1\frac{1}{2}$ to 1. The elevation of the bottom at the inner or southerly end to be 5 feet, and at the outer or northerly end, to be 3 feet above mean low water, the bottom to slope at a regular grade from the inner to the outer end. The channel to be excavated full to the lines and grades above described and as shown on the plan and is to be maintained full size to the satisfaction of the engineer until the water of the river is allowed to flow through it upon the removal of the dam as hereinafter described, but no extra payment or allowance will be made for any excavation below or outside of such lines and grades.

A temporary dam is to be built by the Contractor at or near the inner end of the channel to hold the water in the river during the excavation of the channel, said dam to be removed by the Contractor upon the completion of the channel north of it to the satisfaction of the Engineer, and the water in the river allowed to flow out through the excavated channel, the Contractor at the same time or as soon as possible thereafter to complete the excavation of the channel south of the dam and connect it with the channel of the river so that the water may pass freely into the excavated channel.

The excavated material is to be deposited partly on the outer beach on the easterly side of the excavation and beyond a line 100 feet east of the centre line of the channel, and partly west of a line 100 feet west of the centre line of the channel and between the river and the crest of the ridge of Spring Hill Beach, the amount to be deposited at either place to be determined from time to time by the Engineer.

The amount of material to be removed between the present surface and the lines and grades of the proposed channel as calculated from the aforesaid survey and plan, is 13,050 cubic yards.

The aforesaid plan, and the surveys and calculations based thereon, are believed to be correct, but the Contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein.

In all questions which may arise concerning measurements, lines and grades, the decision of the Engineer to be final. All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the Contractor at his own expense, and the marks given shall be carefully preserved.

Convenient facilities for the inspection of the work to be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly

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observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board.

The work to be commenced as soon as practicable, and to be prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the twenty-fifth day of August, 1898.

Estimates to be made by the Engineer of the amount of work done up to the end of each calendar month, and payment to be made thereon of 75 per centum of the proportional part of the contract price applicable to such work, as computed by the Engineer; the remaining 25 per centum to be paid upon the final completion and acceptance of the whole work.

In all operations connected with the work, the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work, and in the employment of mechanics and laborers in the construction of the work herein contracted for preference shall be given by the Contractor to citizens of the United States.

The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or to any act, omission or neglect of the Contractor or his employees therein.

If the work to be done under this contract shall be abandoned by the contractor, or if the Engineer at any time shall be of opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work and the Contractor

shall thereupon discontinue said work, and the Commonwealth may thereupon complete the work by contract or otherwise, and may pay the expense of the same so far as may be out of any moneys then due or to become due the Contractor under this contract. In case such expense is less than the sum which would have been payable under this contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the Contractor shall pay the amount of such excess to the Commonwealth.

And the Commonwealth of Massachusetts, in consideration of the performance and completion by the Contractor of all of said work in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the Contractor the sum of one thousand eight hundred and twenty-five dollars in full therefor, at the times and in the manner and upon the terms and conditions hereinbefore set forth.

In Witness Whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be executed and delivered under the seal of the Commonwealth with the approval of the Governor and Council; and the said Nelson L. Haynes and William Lake have hereunto set their hands and seals.

THE COMMONWEALTH OF MASSACHUSETTS,

By Woodward Emery,
Clinton White,
Chas. C. Doten,
} *Harbor and Land Commissioners.*

[seal.] WILLIAM LAKE.
[seal.] NELSON L. HAYNES.

Commonwealth of Massachusetts.

In Council, June 30, 1898.

Edward F. Hamlin,
Executive Secretary.

Witness the Seal of the Commonwealth:

Wm. M. Olin,
Secretary of the Commonwealth.

[seal of the commonwealth.]

[G.]

[See page 35 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS 28TH DAY OF JUNE IN THE YEAR 1898, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY ITS BOARD OF HARBOR AND LAND COMMISSIONERS, AND ANTON GRAF OF GEORGETOWN, IN SAID COMMONWEALTH, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The contractor hereby covenants and agrees with the Commonwealth to do and complete all the work specified and described in the following specifications for removing two wrecks, one lying off West Beach in Beverly, the other at Remon's Wharf at the foot of Turner Street in Salem; all of said work to be done and completed in the manner and in accordance with and subject to the terms and conditions in said specifications set forth.

Specifications.

The contractor is to furnish, at his own cost and expense, all the plant, apparatus, materials and labor necessary to break up and remove from tide water and to place on the shore above high-water mark at some place or places to be approved by the Board of Harbor and Land Commissioners, all and every part of the remains of two old wrecks now lying sunken and abandoned, one in the tide waters of Salem Harbor off Remon's Wharf at the foot of Turner Street, and the other off West Beach in Beverly Harbor.

All the work to be subject to the approval and direction of the Engineer of the Board of Harbor and Land Commissioners and to the satisfaction of said Board.

The work of removal of said wrecks shall begin at once and shall be prosecuted with due diligence until completion and shall be completed as soon as possible. The contractor shall save the Commonwealth harmless from all liability for damages to any person or property caused by or in any way arising from the carrying out of this work.

The work to be paid for upon its completion and acceptance, and said Commonwealth, in consideration of the performance and

completion of all of said work, in the manner and in accordance with the terms and conditions aforesaid, hereby covenants and agrees to pay the contractor the sum of one hundred and twenty-five dollars ($125) for the removal of the wreck off West Beach in Beverly, and the sum of one hundred and twenty-five dollars ($125) for the removal of the wreck at Remon's Wharf at the foot of Turner Street in Salem. The above sums to be in full compensation for all the work and other things done, furnished, performed and completed as aforesaid, and to be paid at the times and in the manner and upon the terms and conditions set forth in the foregoing specifications.

In Witness Whereof, on the day and year first above written, the said Commonwealth of Massachusetts, acting by its Board of Harbor and Land Commissioners, has caused these presents to be executed and delivered under the seal of the Commonwealth, with the approval of the Governor and Council; and the said Anton Graf has hereunto set his hand and seal.

COMMONWEALTH OF MASSACHUSETTS,

By WOODWARD EMERY,
CLINTON WHITE,
CHAS. C. DOTEN,
Harbor and Land Commissioners.

[SEAL.] ANTON GRAF.

In Council, June 30, 1898.
Approved:

E. F. HAMLIN,
Executive Secretary.

Witness the Seal of the Commonwealth:

WM. M. OLIN,
Secretary of the Commonwealth.

[SEAL OF THE COMMONWEALTH.]

[H.]

[See page 24 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS TWENTY-SEVENTH DAY OF SEPTEMBER IN THE YEAR EIGHTEEN HUNDRED AND NINETY-EIGHT, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS, WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND THE ROCKPORT GRANITE COMPANY OF MASSACHUSETTS, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The Contractor hereby covenants and agrees with the Commonwealth to provide all the plant, tools, materials and labor necessary and proper to construct two stone jetties at the entrance to Green Harbor in the town of Marshfield. All the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein shall mean the Engineer of the Board of Harbor and Land Commissioners acting directly or through his properly authorized agents, such agents acting within the scope of the particular duties intrusted to them.

Specifications.

The Contractor is to furnish all the plant, tools, appliances, labor and materials necessary and proper to build two stone jetties at the entrance to Green Harbor and put them in condition for use as follows: —

Location and Dimensions.

The jetties are to be located one on each side of the present outlet of Green Harbor River. The one on the westerly or Duxbury Beach side is to start at a point on the beach opposite the house of H. L. Tolman and to run south-easterly 250 feet, more or less, to a point on the beach 975 feet westerly from the highest point of Bluefish Rock and 360 feet southwest from a stone bound on Washburn's Point; thence in a south-easterly direction for a distance of about 1,170 feet.

The easterly jetty is to start on the crest of the beach at the easterly side of the outlet at a point about 200 feet north-westerly

from the highest point of Bluefish Rock and is to run southerly about at right angles to the high water line to a point on the beach about 235 feet westerly from the highest point of Bluefish Rock and from said point south-easterly a distance of about 670 feet, leaving an opening between the outer ends of the two jetties of about 200 feet.

The exact location, size, and method of construction of said jetties are fully shown on a plan on file in the office of the Board of Harbor and Land Commissioners, entitled "Plan of proposed jetties at Green Harbor, Marshfield, Mass., July, 1898," and signed by Frank W. Hodgdon, Engineer. Said plan is referred to and made a part of these specifications and is to be followed in all details not specifically described herein.

The top of the jetties to have a width of 5 feet at the elevation shown on the plan, the slopes on the sides to vary from 2 to 1 to 1 to 1 as shown on said plan. The outer end of each jetty to terminate in a circular head rising to the level of 16 feet above mean low water having a diameter of 10 feet at the level of 12 feet above mean low water, with the sides below sloping at an angle of 2 to 1. Between the levels of 12 and 16 feet the head is to be built cylindrical of large stones of not less than 2 tons in weight, laid and clamped together with iron clamps in the best manner, with full bearings in the face joints without the use of pinners.

Stone.

The stone to be granite quarry grout, of a good quality as regards strength and durability, in angular blocks as nearly cubical as practicable, the smallest dimension being not less than $\frac{1}{3}$ the greatest.

The stone in the core of the jetties to weigh not less than 50 pounds and to average not less than 1,000 pounds. On the faces of all 2 to 1 and $1\frac{1}{2}$ to 1 slopes and on the inner slopes of both jetties for a distance of 150 feet from their outer ends, the stones to weigh not less than one ton each and at least one-fourth to weigh not less than 4 tons each. On the balance of the slopes the face stones to average $1\frac{1}{2}$ tons, none being less than 500 pounds.

Construction.

All stone to be deposited as compactly as practicable and the stone in the faces of the slopes to be placed so as to be least liable to displacement by the sea. The stones forming the top to be of large size, not less than three tons each, with their upper faces so placed as to form a fairly level surface for the full width of the top.

The stones to be deposited in such parts of the jetties as shall from time to time be directed by the Engineer, and the manner in which the stone is placed shall at all times be subject to his approval and direction, and any stone which for any reason has been deposited outside of or beyond the limits of either jetty shall be removed by and at the expense of the Contractor, and placed in one of the jetties where directed by the Engineer.

All stakes, moorings, buoys or other marks which may be required to define the location of the jetties or to hold vessels in place while discharging and placing the stone, to be set, maintained in position and removed by the Contractor at his own expense on or before the completion of the work.

Measurement.

An inspector will be appointed by the Engineer, who will be present at the work or within call at all times during the day, Sundays and holidays excepted, during the execution of the work.

The quantity of stone furnished, if brought to the work in vessels, shall be determined by said inspector from marks placed on the vessel by a legally qualified weigher whose sworn certificate of the correctness of such marks at a recent date shall be furnished to the Engineer by the Contractor before the delivery of the first cargo of stone by such vessel. If deemed necessary by the Engineer, the weight marks of any such vessel may at any time be verified under his direction at the expense of the Contractor.

If the stone is brought to the work in any other way, the Contractor is to provide a method of determining the weight of the stone, which shall be satisfactory to the Engineer.

It is estimated that about 12,800 tons of stone will be required in the west jetty and about 14,500 tons in the east jetty.

Timely notice shall be given by the Contractor to the Inspector of the arrival of each consignment of stone and ample time shall be allowed for the inspector to examine it and determine its amount before any of the stone is placed in the jetty.

No stone will be paid for under this contract which has not been examined by the inspector, or which is for any reason placed outside the prescribed limits of the jetties.

Plane of Reference.

The plane of mean low water referred to in these specifications is that established by the Engineer of the Board of Harbor Commissioners at Green Harbor in 1876. The word "ton" when used herein means a weight of 2,000 pounds.

General Clauses.

Upon the completion of the work, the Contractor to remove from the premises all materials and refuse left from the construction, and to leave the premises in a condition satisfactory to the Engineer.

The aforesaid plan, and the surveys and soundings, with the calculations based thereon, are believed to be correct; but the Contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein, and the Commonwealth does not guarantee them to be even approximately correct.

The drawings and specifications are intended to be explanatory of each other; but should any discrepancy appear, or any misunderstanding arise as to the import of anything contained in either, the explanation and determination of the Engineer shall be considered final and binding on the Contractor. Any errors or omissions in drawings or specifications may be corrected by the Engineer, such correction to govern all work only from the time that the Engineer gives notice in writing thereof.

In all questions which may arise concerning measurements, weights, lines and grades, or of interference with other work or contractors, the decision of the Engineer to be final. All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the Contractor at his own expense, and the marks given shall be carefully preserved.

Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall, on demand, be at once removed from the work.

Any unfaithful or imperfect work which may be discovered before the final acceptance of the completed structure shall be corrected immediately, and any unsatisfactory materials delivered shall be rejected on the requirement of the Engineer, notwithstanding that they may have been overlooked in previous inspection. The inspection of the work shall not relieve the Contractor of any of his obligations to perform good work as herein described; and all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be removed and replaced by good and satisfactory work and material at the expense of the Contractor, and all completed work shall be maintained by him in good condition until the final acceptance of the whole work.

The Contractor hereby agrees to do such extra work in connection with the construction of the work herein contracted for as may

be ordered in writing by the Board of Harbor and Land Commissioners, and to accept in payment for the same, its reasonable cost as estimated by the Engineer, plus 15 per cent. of said estimated cost.

The Contractor to have no claim for compensation for extra work unless the same is ordered in writing by said Board, and unless the claim for the same is presented to said Board before the fifteenth day of the month following that during which each specific order is complied with.

Convenient facilities for the inspection of the work shall be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which they are given.

All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board and not otherwise.

The work to be commenced as soon as practicable and to be prosecuted vigorously in all suitable weather until completion, and to be fully completed on or before the first day of August, 1899.

In all operations connected with the work the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work, and in the employment of mechanics and laborers in the construction of the work herein contracted for preference shall be given by the Contractor to citizens of the United States.

The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents, or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the Contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or relating to any act, omission or neglect of the Contractor or his employees therein. In no event whatever shall the Contractor have any claim for any acts or

omissions under or growing out of this contract against the Commissioners, their servants or agents.

If the work to be done under this contract shall be abandoned by the Contractor, or if the Engineer at any time shall be of the opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work and the Contractor shall thereupon discontinue said work and the Commonwealth may, after the said notice, complete the work by contract or otherwise, and may pay the expense of the same so far as may be out of any moneys then due or to be become due the Contractor under this contract. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the Contractor shall pay the amount of such excess to the Commonwealth.

The Harbor and Land Commissioners, for the Commonwealth, may retain out of any amounts due the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others for work done or materials furnished under this contract; *provided*, that notice in writing of such claims, signed by the claimants, shall have been previously filed with the Commissioners.

Estimates to be made by the Engineer at the end of each calendar month of the value of the work completed in place, and payment to be made thereon of 85 per centum of the value of said work, as computed by the Engineer, the remaining 15 per centum to be paid upon the final completion and acceptance of the whole work, except as hereinbefore provided.

And when the Contractor shall have performed said work in the manner and in accordance with the terms and conditions aforesaid, the Commonwealth of Massachusetts will pay the Contractor the sum of ($1.19) one dollar and nineteen cents for each ton (2,000 lbs.) of stone furnished and placed in the jetties in the manner and within the time hereinbefore prescribed, this amount to be in full compensation for all the labor and materials done, furnished, performed and completed under this contract, the payments to be made at the times and in the manner and upon the terms and conditions hereinbefore set forth.

In Witness Whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be executed and

delivered under the seal of the Commonwealth with the approval of the Governor and Council; and the said Rockport Granite Company of Massachusetts, by Charles S. Rogers, has executed these presents.

ROCKPORT GRANITE COMPANY,

By CHAS. S. ROGERS,
Treasurer.

[SEAL OF THE ROCKPORT GRANITE COMPANY.]

I, John O. Shaw, Jr., Clerk of the Rockport Granite Company of Massachusetts, hereby certify that the last annual meeting of said Company was held March 14th, 1892, that at said meeting Charles S. Rogers was duly elected Treasurer of said Company, and I further certify that the following appears on the records of the Company: "That the Treasurer of the Company be and hereby is authorized to execute and deliver contracts and bonds for and in behalf of this Company."

JOHN O. SHAW, Jr.,
Clerk of the Rockport Granite Company.

[SEAL OF THE ROCKPORT GRANITE COMPANY.]

THE COMMONWEALTH OF MASSACHUSETTS,

By WOODWARD EMERY,
CLINTON WHITE,
CHAS. C. DOTEN,
Harbor and Land Commissioners.

COMMONWEALTH OF MASSACHUSETTS.

In Council, Sept. 28, 1898.
Approved:

E. F. HAMLIN,
Executive Secretary.

COMMONWEALTH OF MASSACHUSETTS.

OFFICE OF THE SECRETARY,
BOSTON, Sept. 28, 1898.

Witness the Seal of the Commonwealth:

WM. M. OLIN,
Secretary of the Commonwealth.

[SEAL OF THE COMMONWEALTH.]

[I.]

[See page 33 of this report, *ante*.]

REPORT OF THE SUPERINTENDENT, PROVINCE LANDS.

PROVINCETOWN, MASS., Dec. 1, 1898.

To the Board of Harbor and Land Commissioners.

GENTLEMEN: — As Superintendent of the Province Lands, I respectfully submit the following report for the year ending Nov. 30, 1898: —

Work has been continued upon the lands the present year about on the same lines as during the last two seasons, namely, the setting out of beach grass, transplanting young trees and shrubs and planting seed.

Active operations were begun this season about the first of April, by transplanting young trees and shrubs from the nursery and the adjacent woods and low lands, these being placed along the slope of the northern range of dunes among the beach grass of recent planting. Of the trees transplanted, about 33,000 were young pines of two years' growth, from the nursery, 1,200 silver poplars and 300 black locusts. The pines consisted of four varieties, about equally divided, as follows: seaside pine (*Pinus maritima*), Scotch pine (*Pinus sylvestris*), Austrian pine (*Pinus Austriaca*) and pitch pine (*Pinus rigida*), all of which are doing very well with the exception of the seaside pine, which does not seem to bear transplanting at all well, although extra care was taken in the work, showing no better results than in the season of 1897. A small proportion only of them survive, while, of the other varieties named, 95 per cent. survived and show excellent growth. Two years' trial of the seaside pine proves it to be of very little value for transplanting purposes.

We have used during the season a large quantity of bayberry (*Myrica cerifera*), which is found in abundance in the low grounds and bogs adjacent to the dunes, and is proving valuable for the work, as it roots readily and is very hardy. We have also transplanted about 500 Scotch broom (*Genista scoparia*). The results obtained from former planting of this shrub are very satisfactory,

and seem to warrant continued and more extensive use in the future.

The silver poplars and locusts which have been set out are doing well, but it seems to me that for the purposes of this work we should depend almost entirely upon trees of the evergreen kinds, rather than upon the deciduous trees, which would, at least for several years, afford but little protection to the sand dunes from winter winds.

In addition to the work of transplating, we have made use of a considerable quantity of pine seed of the varieties named above, with marked success. While the seaside pine does not prove a success in transplanting, results obtained from the use of the seed are highly gratifying; it germinates readily and makes quick and vigorous growth. In the use of seed two plans have been adopted; one to sow broadcast over the surface that is to be set out with beach grass, and, as the work of setting the grass progresses, the seeds are sufficiently covered; the other, to plant among the grass in hills two to four feet apart, with hoe, both methods showing equally good results and can be used to advantage.

We have continued the work of beach-grass planting the present season in the same manner as for three seasons, and have covered about 20 acres, about 3 acres of which were planted in May and the rest during September and October. The work has been done on the northern range in the vicinity of Grand View Hill, and extending eastwardly along the slope a distance of about 1,500 feet.

We have covered, up to the present time, about 90 acres of the barren surface with beach grass, which is in a favorable condition and fully meets the requirement of holding the sands until a growth of trees can be introduced. Not a single instance of moving sand is observed throughout the entire area. Of the 90 acres covered, about 70 acres have been filled with trees and shrubs, either by transplanting or by seed, with very favorable results.

Doubtless we shall be obliged to continue the use of beach grass in the prosecution of the work, as there seems to be nothing available equal to it as a sand binder, or that equally withstands the cutting of the sands. The method of propagation by transplanting will also have to be continued, as the use of seed has not been successful, owing to droughts and sand drifting. We have made some use of brush for covering the surface of the dunes in the vicinity of Grand View Hill for the protection of the grass planting and the road from the drifting sand.

A limited amount of work in the nursery has been done for the purpose of starting young trees and shrubs from seed for trans-

planting, and we shall have from 35,000 to 40,000 young trees of two years' growth ready for moving in the early spring. It is a question whether it is economy to continue the nursery work to any great extent. If the present method of using pine seed directly upon the ground is successful, which now seems very probable, and which one or two years' more trial will decide, much of the labor expended upon the nursery can be discontinued, especially for the starting of pine trees, and the nursery utilized for the propagation of such shrubs as the *Genista* and a few others.

But little work has been done this season towards extending the State road, but this road and others through these lands have been kept in good condition for the safety and convenience of the public and are much used.

We have had very favorable weather for our season's work, and the results attained meet our expectations, and seem to justify the conviction that we are operating upon correct lines.

Respectfully submitted,

JAMES A. SMALL,
Superintendent of the Province Lands.

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ANNUAL REPORT

OF THE

BOARD OF HARBOR AND LAND COMMISSIONERS

FOR THE YEAR 1899.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1900.

PUBLIC DOCUMENT . . . . . No. 11.

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Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1899, covering a period of twelve months, from Nov. 30, 1898.

From Dec. 1, 1898, to Nov. 30, 1899, the Board has held 244 meetings, has given 344 formal and informal hearings, and has received 192 petitions for license to build and maintain structures and for privileges in tide waters, great ponds and the Connecticut River, to dredge material, to remove material from beaches, and for other purposes, being an increase of 31 meetings, 62 hearings and 20 petitions, over last year.

One hundred and sixteen licenses for structures and privileges in tide waters, great ponds and the Connecticut River have been granted during the year; also 38 permits for dredging, for the removal of material from beaches, and for other purposes.

During the year the Board has made 18 contracts, involving the payment of $193,738.89 under appropriations made by the Legislature.

On June 20 and September 19 the Board met with the Board of Railroad Commissioners, acting as a joint board, under chapter 448 of the Acts of 1899, and heard counsel and others interested in the petition of the Boston, Cape Cod

& New York Canal Company, for authority to issue stock and bonds.

On October 2, 27, and November 2, 16, the Board met with the Board of Railroad Commissioners, acting as a joint board, under chapter 99 of the Resolves of 1899, and heard counsel and others in the matter of the New Bedford and Fairhaven bridge.

On November 28 the Board gave a hearing to parties interested in the matter of proposed plans of the location and construction of a canal between Buzzards Bay and Barnstable Bay, filed by the Boston, Cape Cod & New York Canal Company, under chapter 448 of the Acts of 1899.

On January 25 counsel for the Old Colony Railroad Company withdrew the petition and plans of said company, filed with the Board Dec. 28, 1898, for license to do anything in South Bay which, by the terms of the decree of the superior court for the abolition of the grade crossing of Dorchester Avenue, dated June 23, 1898, said company is required to do in tide water.

On February 15 Richard A. Everson and others, petitioners for license to construct dams and flumes and draw water from Maquan Pond in Hanson for flowing cranberry bogs, were given leave to withdraw, it appearing that the water in this pond could not be lowered without exposing the shores and injuriously affecting owners of property abutting thereon.

On March 29 the petitions of Floretta Vining and T. C. W. Nash for authority to remove material from Stony Beach in Hull, under chapter 163 of the Acts of 1878, were dismissed, as it appeared that there was a question as to the title of the petitioners to a portion of this beach.

On May 12 the trustees of the Boston Real Estate Trust withdrew their petition for license to fill solid in Fort Point Channel adjoining the southerly side of Congress Street in Boston.

On May 17 the Board refused to grant a license to Henry W. Goodnow to build a wharf in Lake Quinsigamond, near the causeway in Worcester, as the petitioner could attain his object by dredging adjacent to his existing wharf in this location.

On May 29 Henry W. Goodnow, petitioner for license to build a wharf in Lake Quinsigamond in Shrewsbury, was given leave to withdraw, as the owner of the land in front of which the wharf was to be built objected thereto.

On June 26 the Wellington-Wild Coal Company, petitioner for license to extend a wharf on the canal near Bridge Street in Cambridge, was given leave to withdraw.

On November 22 Harrison Mitchell and John C. Augustus, petitioners for license to build wharves in Hull Bay on Stony Beach in Hull, were given leave to withdraw.

Inspections have been made by the Board at various times of work completed and in progress under appropriations made by the Legislature on the Commonwealth flats at South Boston, the Province Lands in Provincetown, at Osterville, Green Harbor, Lake Anthony, Scorton harbor, Menamsha Inlet and Witchmere harbor; also of the sites of proposed work in tide water, great ponds and the Connecticut River, upon petitions and plans presented to the Board, and of various beaches, relative to the proposed removal of material, and damage caused by the great storm of November, 1898.

The Commonwealth Flats at South Boston.

This considerable asset of the Commonwealth is steadily increasing in value.

The plant of the Metropolitan Coal Company, at the southeasterly corner, with its increasing business, shows the adaptability of the adjacent lands for commercial purposes.

The Commonwealth pier, now nearing completion, indicates the availability of the water front for commerce and maritime uses.

The opening to travel of the new Summer Street bridge across Fort Point Channel, and the early fulfilment of the plan for elevating Summer Street over the tracks of the New England Railroad, will soon occasion a flow of traffic and travel across that tract. From this elevation attention will be drawn to the attractiveness and value of the surrounding land for building purposes.

In January sales were consummated at satisfactory prices of two parcels of the Commonwealth's land lying between

Summer and Fargo streets, easterly of C Street and westerly of E Street, at its junction with Summer Street, comprising in all 304,521 square feet, for the sum of $437,968.90.

These lots have been purchased with a view to improvement when Summer Street shall be opened to public travel. It was part of the understanding with the purchasers of these lots that Fargo Street should be finished for travel and use at an early day.

In March another parcel, of 10,500 square feet, bounding on B and Anchor streets, near the southerly boundary of the Commonwealth's land, was sold for the sum of $6,300.

In November 74,970 square feet of land, lying between E Street and the Reserved Channel, together with the flats in front thereof and a pile wharf built by the Commonwealth, was leased * to Charles Taft Chapin for a coal wharf, for the term of fifteen years from May 1, 1900, at a yearly rental of $4,000.

The Commonwealth Pier.

The core or solid portion of the Commonwealth pier, described in prior reports, is now completed, 300 feet wide and 1,150 feet long. The outer walls of the structure are of granite blocks, resting on a foundation of piles driven below extreme low-water mark. This increases the solid land of the Commonwealth about 8 acres. The material for filling between these walls, excepting the grout and gravel placed immediately adjacent thereto, was excavated from the docks adjoining. Owing to the semi-liquid character of the filling material dredged from the dock on the westerly side of the pier, it became desirable, as the various layers were deposited, that more time for drying out should be given before another layer was deposited. For this reason, when the sea walls and other work had been completed, certain small areas had not been fully filled to grade. It was thought best to leave these areas for the present, and to complete the filling during the coming winter and spring with the material from cellar excavations and other sources, as that is constantly brought to the Commonwealth's property for a dump. This work is now progressing. A coat-

* See Appendix C.

ing of this same dry filling is being spread over the other portions of the pier, forming a roadway and levelling up the depressions where the clay filling has unequally settled. In excavating the material used for filling the pier, the dock on the westerly side has been dredged to the depth of 30 feet at mean low water throughout its whole width on the Commonwealth's property from the harbor line to a point 450 feet up the dock. The balance of the distance to the head of the dock has been excavated to the same depth for a width of 100 feet adjoining the face of the proposed platform. On the easterly side of the pier only sufficient dredging was done to provide for the construction of the sea wall and platform. At the outer end of the pier the harbor has been dredged to the depth of 30 feet at mean low water for a width of 70 feet outside the harbor line. Between that and the ship channel, a distance of about 1,080 feet, previous excavations had been made to the depth of 23 feet at mean low water. The material which is to be removed from the balance of the dock on the westerly side, as well as a portion of that which was taken from the dock on the easterly side, will have to be carried to sea.

During the winter of 1898–99 plans and specifications were prepared for the oak pile platform which is to cover the outer slope of the foundation of the sea wall of the pier, and form the face of the wharf. This is to consist of large oak piles, spaced about 8 by 6 feet, and so driven that a dock can be dug and maintained 40 feet below mean low water whenever required. The floor of the platform is to be built of Georgia pine. The outer corners are to be heavily braced with timber. The belay posts are to be of cast iron, securely bolted to the framing of the wharf, and to be of a size and shape best calculated to hold the mooring lines without interference with the discharging of vessels.

The contract * for the platform was awarded to the lowest bidder, George A. Cahill, March 6, 1899, and requires the whole work to be completed July 1, 1900.

When completed, the Commonwealth will have the largest pier on the Atlantic coast, having an area of about 11 acres,

* See Appendix A.

with docks adjacent, 1,200 feet long, excavated to a depth of 30 feet at mean low water, which may be increased to 40 feet, if desired, without danger of undermining the adjacent pier.

Congress Street.

Congress Street was almost impassable when the filling for elevating Summer Street was being deposited, and it became the duty of the Board to supply a new thoroughfare. As a portion of Fargo Street was to be laid out and paved as part of the project in substitution of Congress Street, under a decree of the court, the Board availed itself of the opportunity to complete the remainder of Fargo Street at the same time, under one contract * for the entire street, and thus make a saving in the cost to the Commonwealth. Plans and specifications were prepared for paving with granite blocks 1,600 feet of Fargo Street, 50 feet wide, and that portion of E Street connecting it with Summer Street extension, 560 feet long and 60 feet wide, and also for setting the granite edge-stones and cross-walks; also for building 17 catch-basins and about 3,000 feet of pipe drains, with the necessary man-holes and tide-gates as laid out and planned by the sewer department of Boston.

Since this work was finished, in October, the city of Boston has paved a portion of Congress Street, so that there is now a block-paved and thoroughly finished street, with the exception of brick sidewalks, across the Commonwealth's land from L Street bridge through Summer, E, Fargo and C streets to the junction of the latter with Congress Street. This has been accomplished with but little delay and inconvenience to the public, and at comparatively small cost to the Commonwealth. The total sum paid as its share for the foregoing, independent of its percentage of the cost of elevating Summer Street (to be ascertained only on its completion), is $23,590.61, for grading, curbing, draining by storm-water sewers and catch-basins, and paving the street 50 feet wide. With the demand for the sale of lots, other streets in this locality will shortly need to be paved and put in order for public travel and use.

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* See Appendix B.

Summer Street.

Summer Street, under construction by the city and railroad, is progressing slowly, and it is said it will take another season before it will be ready to be opened. The abutments at B and C streets, where Summer Street crosses overhead, are completed, and the filling for elevating the street and the ramps approaching thereto is substantially in place. It will be some time yet, however, before the bridge work across the tracks of the New England Railroad, now under way, will be set in position.

Northern Avenue.

In previous reports the Board set forth the necessity of building Northern Avenue and Northern Avenue bridge, as essential to the most useful development of the Commonwealth's property at South Boston. The proposed avenue and bridge are shown on a plan annexed to the report for the year 1896, and therein, on page 7, it is said: "It shows the avenue on the Commonwealth's lands at a width of 150 feet, as being the proper width, in the light of modern requirements, for an avenue at the head of wharves of the proposed class. The proposed Northern Avenue will necessarily be at grade with the railroad tracks. Its purposes are to supply additional conveniences for delivering and shipping merchandise at the proposed docks and wharves by both rail-haul and truckage, and to afford more direct and shorter communication at grade with the business centres of the city and with connecting railroads. Its use would naturally be confined to heavy teaming and railroad transportation, such as is connected with loading and discharging steamships."

The pressing necessity for another bridge across Fort Point Channel is urged again in the report for the year 1897, page 9, where the condition of Congress Street bridge is referred to, and the statement made that before long it will have to be closed to public travel for repairs.

Again, in the report for the year 1898, the value of this bridge to the property of the Commonwealth at South Boston is fully set forth. It is there stated that Northern

Avenue and bridge were projected as early as 1866 by some of our wisest citizens; that in 1873 an agreement, to which the Commonwealth, the Boston & Albany Railroad Company, the Boston Wharf Company and the city of Boston were parties, made provision for building it as part of the plan for filling and developing the flats. The essential relationship it would bear to a proper development and use of this property was then foreseen. The Commonwealth is about completing the expenditure of nearly $400,000 in building a pier of great size with deep-water accommodations in the adjacent docks for the largest-sized steamships. Transportation between this dock, railroad terminals and the centres of the city must be at grade, and by the shortest and most direct routes. Had the construction of this avenue and bridge been assured, the Board feels confident that a lease of the entire pier could have been contracted for before its completion.

Repairs on the Congress Street bridge cannot be long delayed after opening Summer Street extension to public travel. These repairs will have to be extensive, and will include a widening of the draw-opening for the passage of steamships, which now are discharged in mid-stream and their cargoes of sugar delivered in lighters to the warehouses above the bridge.

A long time will elapse during which public travel will be shut off from this bridge. The new Summer Street, elevated above the surrounding level, is not equally convenient of access, and would impose the additional burden of hauling every load up 10.5 feet to get across the bridge. Under these conditions, it would seem most opportune for the Commonwealth to unite with the city and the railroad in laying out and constructing Northern Avenue and bridge, and the Board recommends the enactment of the necessary legislation.

The Commonwealth Flats at East Boston.

In its last annual report the Board related its taking in the name and on behalf of the Commonwealth of the flats lying on the easterly side of East Boston, between Jeffries Point and Wood Island Park, and bounding easterly on the United States pierhead line, being a strip 1,500 feet in width, taken

under the provisions of chapter 486 of the Acts of 1897. It has during the year settled some of the claims for the best portions of the flats taken, at the rate of $2\frac{1}{2}$ cents a square foot, which is the same rate as for those settled the previous year. The largest claim, however, is that of the East Boston Company, which will have to be determined by a jury in the superior court, and is now in the hands of the Attorney-General.

It is the duty of the Board to emphasize what it has before said, that the value of the flats taken lies in their development in connection with railroad terminals.

The great growth of exports from the port warrants the belief that all the water front available for the approach of trans-atlantic steamships and at the same time accessible to the railroads will be wanted before long, and therefore plans should be carefully matured ready for development whenever the Legislature shall see fit to make an appropriation for the purpose. The State Board on Docks and Terminal Facilities, 1896, on pages 95, 96 of its report to the Legislature, made certain recommendations, advising a change of location of railroad tracks in East Boston. These recommendations were based on a communication of its engineer, Thomas Doane (see pages 136, 137 of the above-named report), than whom no engineer living had a clearer vision or better grasp of the problem of mutual or common railroad terminal interests and possibilities in and around Boston. They also had the approval of the accomplished engineer of the city of Boston, William Jackson, and were advocated in the public interest by the mayor of Boston in 1897 and subsequently. They involve the surrender by the Boston, Revere Beach & Lynn Railroad of its location between its East Boston ferry slip and Trumbull Street to the Boston & Albany Railroad and the Boston & Maine Railroad, and the surrender of the locations of the two last-named railroads from the junction of Bennington and Trumbull streets south to Marginal Street. Also they contemplate the acquisition of the last-named locations by the city of Boston for a boulevard, and the granting of the Boston, Revere Beach & Lynn Railroad a location thereon, upon its adopting the use of electricity for motive power. The ferry in con-

nection with this railroad could be run from the South Ferry at Lewis Street to Rowes wharf, its present landing, and thus better accommodate its passengers than at present by giving them the use of two ferries.

The arrangement above outlined is generally admitted to be of great public advantage.

A single glance at the map shows the increased water front areas which would be served by such a change. It would locate the tracks of the two great railroads near to the rear boundary of the Commonwealth flats, which have a frontage on the pierhead line of about 4,000 feet, with a depth of 1,500 feet, and include about 100 acres. This dedication by the Commonwealth of another large section of water front to the growing demands of commerce is a sagacious realization of opportunity; but it needs to be followed up by legislation requiring the foregoing changes to be made, in order to reap the advantages offered by the situation; otherwise the improvement of the territory acquired, by preparing it for the cheap handling of merchandise and products of all kinds in transit from railroad cars to vessels' bottoms and *vice versa*, would be liable to be visionary and profitless. Should the proposed change be made, it would become necessary to dredge a ship channel from the water front of the newly acquired flats to deep water, of a depth sufficient for the largest steamships now using this port, and for that purpose the Board would recommend not less than 35 to 40 feet.

There are various ways in which the East Boston acquisition might be advantageously handled. All plans therefor would necessarily include deep-channel approaches. The Board has several studies under consideration, but, until the location of the tracks of the railroads is settled, and while the determination of damages for the taking is pending, it is obviously unadvisable to promulgate a matured project. In any plan of development, however, a sea wall or bulkhead would first be required.

Boston Harbor.

The port of Boston is of more value than all others to the Commonwealth, and within a territory of 12 miles from the State House more than a third of the population of the State is congregated and more than one-half of her wealth is massed.

The population of the State of Massachusetts, by the census of 1895, was 2,500,183, of whom there were residing within a circuit of 12 miles of the State House 1,004,424, or 40.17 per cent. of the whole. The valuation of the whole State, as assessed May 1, 1898, was $2,894,436,611, of which amount $1,697,177,290, or nearly 60 per cent. of the whole, lies within the area above named.

The size of ocean steamships within the past fifteen years has trebled, and now the deepest draught vessels steaming out of the harbor, if loaded to the limit of the summer load line, would draw about 32 feet. The increasing draught of the steamships has advanced more rapidly than the harbor channels, and the problem of deepening them sufficiently to provide navigable water has assumed serious proportions and demands prompt solution.

The federal government has been working for a series of years upon its project of August, 1892, for enlarging the main ship channel to the width of 1,000 feet and the depth of 27 feet at mean low water. All dredging between President Roads and Boston Light or Point Allerton, in what is known as the lower ship channel, has been completed. The channel is of full depth for about 800 feet, the remaining 200 feet being obstructed by ledges. These are now being surveyed, and a contract will probably be made at an early day for their removal next summer.

The upper channel from President Roads north is now being dredged, with the expectation that by June next it may have a depth of 27 feet for a width of 500 feet, as far as the inner anchorage. In the mean time, by reason of the increasing draught of the steamships coming to the port, the provisions of the project have become inadequate before their consummation.

This Board has repeatedly called attention to the inadequacy of the harbor channels, and can do no better than to quote a paragraph from its annual report for 1895, page 12, as follows: —

> It seems to the Board that the time has come for considering the much-needed improvements in Boston harbor in a broad and comprehensive way. The federal government is at work on its project of deepening and widening the main ship channel, so as to obtain

27 feet at mean low water and 1,000 feet in width up opposite to Constitution Wharf. But since this work has been entered upon the draught of the largest vessels which now sail to and from this port has increased several feet, and their carrying capacity has doubled.

Under these circumstances, the question as to what is to be done to maintain Boston as a first-class port becomes imperative. A careful study of the map gives an adequate solution. Broad Sound Channel, on leaving President Roads, is obstructed between Deer and Green islands and for some distance outside by shoals, and by sundry rocks and ledges beyond. It is thought that an expenditure of from one-half to three-quarters of a million dollars will remove all obstructions and give a fair way from the bay into President Roads, 30 feet deep at mean low water and several thousand feet wide. This would ensure an adequate approach to the harbor in a straight course for all time to come. But beyond this, in the interest of economy of time and despatch, without which the sharp competition of the present day cannot be met, vessels of the largest size should be enabled to steam to their berths without delay in waiting for the turn of the tide. To this end is required a channel of varying but sufficient width from President Roads to the railroad terminals, with a depth of 30 feet at mean low water. These two requirements are essential to enable Boston to provide adequate accommodation for the growing demands of her commerce.

Four years have passed since making that report, during which time a survey and estimate of cost for excavating a channel 1,200 feet wide and 30 feet deep through Broad Sound have been made, and Congress has authorized the completion of the project at a cost not to exceed $450,000, and has appropriated $5,000 to begin with. Proposals have been advertised for the contract, but as yet the lowest bid is in excess of the sum authorized. Such, however, has been the rapidity of increase in the draught of vessels, that 30 feet is no longer adequate, and 35 feet is now recommended for the minimum depth of all main harbor channels.

It is of vital importance that every possible effort should be made to secure a channel from the Navy Yard to the sea, of a minimum width of 1,200 feet and a minimum depth of 35 feet; and until that shall be accomplished, the largest steamships cannot be loaded with export cargoes to their full capacity and depart at any time of the tide with entire safety.

These reasons, among others, demonstrate the necessity for action in the direction of improving the facilities for navigating large vessels into and out of the harbor of Boston; and the action should be immediate, in order that we may not be behind the more southern Atlantic ports in our ability to accommodate the largest class of deep-draught steamships. If early action cannot be had by Congress on this matter of vital importance to the growing commerce of this port, then it naturally becomes a question of moment to be considered by the Legislature. To turn the tide of commerce away from us just as it has begun to set strongly in our direction, by the failure to provide accommodations that may be found elsewhere, might be to turn adrift what could not subsequently be brought back. For a period of nearly a generation now the exports and imports have been growing, until they reached in 1899 the figure of $190,561,119, of which $127,133,043 were exports and $63,428,076 were imports. The regular and frequent sailings of steamships to-day have greatly encouraged importations through this port, and the rates have become more favorable with the growth of business. The opportunity thus afforded to the manufacturers, within easy reach, for the export of their manufactured products, cannot readily be over-estimated. Every effort should be made by this community to encourage this growth, and nothing can conduce more to that end than the provision of broad and deep waterways for the safe ingress and egress of the great trans-atlantic liners.

The importance of these considerations has been urged in the last three annual reports * of this Board, and, in the interest of the whole Commonwealth, the views therein set forth cannot be too frequently or urgently reiterated.

The great contest for the carriage and shipment of western export products is just beginning. The opening of the all-Canadian waterways to the sea, shortly to be completed, will stimulate the exports through Montreal. The improving conditions at Philadelphia and the cheap freights by the way of Baltimore and Newport News will continue to attract traffic *via* those ports. The traffic interests between the

* Report, 1896, pages 11-17; 1897, pages 16, 17; 1898, pages 16, 17.

north-west and the gulf ports will exert tremendous efforts in competition with the east and west trunk lines to secure the products of the interior for shipment *via* their terminal ports. Amid these warring interests, the true course for the Commonwealth is to do all in its power to assist in procuring for Boston wide and deep waterways. These attract the steamships and lessen risks of navigation. Add thereto the advantage of being the nearest great Atlantic seaport by 180 miles to the English Channel, and we are in a position to hold our own in the competition of the future as in the past, and keep on steadily increasing the volume and value of both exports and imports.

Boston lies at the gateway of the great north-western territory both of the United States and Canada. In summer the St. Lawrence River is the natural pathway for as much north-western grain and as many cattle as the facilities afforded at Montreal can accommodate, but which should find a winter port at Boston.

The ports of St. John, New Brunswick and Portland compete for their share of grain at all seasons, but the superior advantages of a port of large imports as well as exports lie with Boston.

The coastwise, West Indian and South and Central American commerce is steadily increasing, so that, taking all the demands of shipping together, the wharf accommodations of Boston have during this past year proved insufficient. If proper provision is to be made for the growth of maritime commerce in the future, it will be necessary to forward measures already in the hands of the Board, such as perfecting the accommodations for reaching the Commonwealth pier, improving the newly acquired water front at East Boston, and enlarging the anchorage grounds in the upper harbor; or, in lieu of the latter, providing some facilities for caring for vessels before they are able to go to their respective piers.

Anchorage.

The federal government is dredging the main channel from the sea through the inner harbor, and many shipping merchants are of opinion that the Commonwealth should provide

such additional facilities as may be needed outside of the main channel.

A scheme has been advocated, by persons familiar with the requirements of Boston harbor, in favor of dredging Bird Island flats to sufficient depth to secure anchorage accommodations. A study of this problem has been made by the Harbor and Land Commissioners, and the Board believes that the cost to the Commonwealth of the dredging would be too great to be warranted in view of the accommodations thereby furnished. In the opinion of the Board, structures might be built on the southerly side of these flats, which, with a comparatively small amount of dredging, would furnish accommodations for a much larger number of vessels than could ever be safely anchored on the area that would be made available by the total removal of the shoal.

It is recommended that authority be given for a survey and investigation of this project.

Dredging by the Commonwealth.

During the spring the Winthrop Steamboat Company notified the Board that the channel leading to their wharf at Winthrop had shoaled to such an extent that it was difficult for their boats to reach the wharf at low water. A contract was therefore made, May 4, 1899, with the Bay State Dredging Company, to excavate the channel 50 feet wide and 8 feet deep at mean low water. The work was completed June 3, 1899, 5,831 cubic yards of material having been removed, at a total cost of $1,632.68.

Charlestown Navy Yard.

Great improvements are projected at the Navy Yard, some of which are now being carried out. Although they are wholly under federal authority, they are, nevertheless, of considerable interest to the Commonwealth and to the port of Boston.

Under the provisions of an act of Congress, passed this last session, a large wet dock, 570 feet long by 160 feet wide, between the westerly end of the Navy Yard and the easternmost Hoosac Tunnel pier, is under construction. Ac-

commodation will be furnished at this dock for coaling the largest war vessels alongside the pier; also a new berth will be supplied to the Fitchburg Railroad, well adapted for the convenience of trans-atlantic steamships. This is expected to be completed next September.

The government is also constructing a large stone dry dock, to be located just east of the present dry dock. Its length on the coping over the head to the outer gate sill will be 750 feet, and its width at the entrance on mean high-water level will be 100 feet, with a draught over the sill of 30 feet. This will give an opportunity, in case of need, for docking merchant steamships of the largest class that come to this port.

The project further embraces the extension of wharves numbered 2, 4, 5 and 6 to the new pier and bulkhead line, and includes the widening and lengthening of the docks or slips leading to the old and new dry docks. It is proposed eventually to protect the entire water front by a concrete-faced quay wall, and to dredge to a uniform depth of at least 30 feet at mean low water in front thereof.

All these improvements require time and suitable appropriations from Congress for their completion. They are made possible by the provisions of chapter 64 of the Acts of 1899, ceding certain of the Commonwealth's tide-water land, and jurisdiction over the same, to the United States, for the purpose of enlarging the Navy Yard.

Fort Point Channel.

The conditions in this channel have been bettered the past year by the removal of the bridge of the New England Railroad Company, the navigation through the lower channel thereby being much improved. The draw opening of the new Summer Street bridge is 50 feet in width, and the class of vessels used in commerce as far as Federal Street bridge will require, when Congress Street and Mount Washington Avenue bridges are rebuilt, that they have draw openings of the same capacity.

There is now no longer reason for delay in asking Congress to make the appropriations necessary to carry out the project recommended by Colonel Mansfield, referred to in

last year's report, page 12, for completing the improvements proposed in 1885, and subsequently carried out as far as Congress Street, and which was then estimated could be completed to Federal Street bridge for $60,000.

The new drawbridge of the New York, New Haven & Hartford Railroad Company is a rolling lift bascule bridge, in three sections, each section carrying two tracks, and spanning the entire draw opening. It is operated by electricity, each section being entirely independent of the other. Owing to the sharp angle at which the railroad crosses the channel, the trusses are of unusual length, being 84.5 feet between bearings, and when lifted projecting about 130 feet above the bridge seats. The whole bridge rests on 7 stone piers, and is in every way a model structure.

Shirley Gut.

The conditions at Shirley Gut awaken the serious apprehension of the Board. The United States Coast Survey charts of 1860 showed a channel of a minimum width of 240 feet between the banks at mean low water and depth of 20 feet. From surveys in 1871, 1881, 1893, 1895 and 1898, it appears that this channel has narrowed to a minimum width of 100 feet, and shoaled to a minimum depth of 8 feet. The contraction and shoaling are proceeding at a rate that by natural action alone, if left without interference, will in no great length of time close the channel to navigation. The use of the channel is increasing rather than diminishing. It lessens the distance for boats plying between Boston wharves and Lynn and Nahant. It is regarded generally as a valuable water way, and one that it would be inadvisable to permit to be closed to navigation.

South Bay.

In its annual report to the Legislature for the year 1890 the Board made the following statement: "There can be little question that it would be a public improvement to fill some portions of the bay and to deepen others," and legislation was recommended that should "remove any obstacles which the existing harbor lines present to the improvement

of the bay." In the following year a topographical survey of the bay was made and harbor lines established, together with provision for its sanitary improvement.

The exclusion of business occupants from the wharves on the west side of Fort Point Channel by the building of the Southern Terminal Station created a demand for wharves in the South Bay. The wish on the part of owners of land abutting in the bay to improve their property led to a careful estimate of the water area required in the bay to accommodate the commerce which might be calculated to follow the building of piers and docks around its shores.

The present harbor lines established by chapter 278 of the Acts of 1898 followed, and by authority of that act also the contract referred to as Appendix B in the report of the Board for 1898 was made. Proceedings were taken in the supreme judicial court to prevent action under that contract, and the law on which it was based was declared to be unconstitutional, as lacking in the provision for indemnification to parties injured by proceedings under it.

Under the provisions of chapter 469 of the Acts of 1899, which followed the decision of the court, a scheme or project for the improvement of the bay has been adopted, the plan whereof is on file in the office of the Board. Subsequently a taking * was made of that part of the bay nearest the wharves already in use, and best calculated to serve their convenience. A contract will shortly be made for excavating the flats taken to the depth of 12 feet at mean low water, and as rapidly as possible the improvement authorized by the statute for the purpose of improving navigation and the sanitary condition of the bay will proceed.

The value to the public of this interior water basin in bringing heavy and bulky materials at low cost nearer the place where they will be needed, and in saving the streets from the heavy teaming and incidental congestion by removing the same, is not easily over-estimated, and will become an obvious demonstration as the population of the city increases.

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* See Appendix D.

Cove Street Bridge.

Under chapter 466 of the Acts of 1899, the city of Boston petitioned the Board for approval of plans for building Cove Street bridge over Fort Point Channel. The hearing was well attended by those in favor and those opposed to the petition. The Board was asked to rule on the point as to whether the Board, under chapter 466 of the Acts of 1899, had authority to consider this matter in connection with the interests of navigation, and whether, if it found that said bridge if built according to plans submitted would seriously impede navigation, it could report the matter to the next General Court without approval of said plans. The Board thereupon ruled that the power of the Board is limited by the provisions of chapter 19, Public Statutes, particularly section 8, which provides that the Board may alter plans at its discretion, but may not diminish or control the legislative grant; and, as this is a grant of the Legislature, the Board is restricted to the approval of plans for the construction of this bridge in a manner which will cause the least obstruction to navigation, the Legislature having said that a bridge might be built in this location. Therefore the Board declined to go into the question and hear evidence as to the detriment to navigation which the building of this bridge in this locality would cause. The Board subsequently voted to approve the plans as submitted and to issue the desired license.

Subsequently the War Department disallowed the project of another bridge across the channel at this place; but the matter has been reopened and heard by a special board of army officers appointed for that purpose. As yet no decision has been rendered.

Charles River.

The new bridge from Boston to Charlestown between Warren and Charles River bridges has been completed. The draw openings are 50 feet wide, and the draw itself weighs 1,100 tons. It was opened to public travel on Nov. 27, 1899. The old Charles River bridge is about to be removed, in compliance with the statute.

The old West Boston bridge from the foot of Cambridge Street in Boston to Main Street in Cambridge was closed, and the temporary wooden structure, built to take its place while the new bridge required by chapter 467 of the Acts of 1898 is building, was opened to public travel on Oct. 19, 1899.

The Metropolitan Park Commission has steadily progressed in its work on the south bank of the Charles, between Boylston Street and the Arsenal Street bridge. A large quantity of gravel and other material has been excavated from the river, for the purpose of surfacing up these banks and filling the marshes. The result of the dredging has been generally beneficial to navigation.

Mystic and Chelsea Rivers.

During the past year great progress has been made towards completing the plant of the New England Gas and Coke Company, which occupies many acres of improved property bordering on the north side of Mystic River and the west side of Island End River, just above the Chelsea bridge. This great plant, which is expected to cost several millions, has not only raised the value of the marsh flats adjoining the river bank, but has attracted attention to the possibilities of their use and development. It is planned to widen the present draw in Chelsea bridge (north) over Mystic River, from 45 feet, its present width, to 60 feet, and also to widen and deepen the channel in Mystic River through and above the bridge. These improvements will facilitate the navigation of the river by larger vessels, and thus encourage a demand for wharf privileges in the neighborhood of the surrounding thickly settled and fast-growing communities.

With a view to the growth of the maritime commerce and requirements of the port, the Board has been forced to determine that the time has come to make some general regulations with respect to the plan of development of the shore property of these two rivers. If this action is taken seasonably, the mistake of allowing shore owners to cover their flats with structures for wharfing and other purposes, without regard to size or capacity of docks or convenience to shipping, may be avoided, and development may be guided

in a systematic way. We learn from the errors of other ports, both in this country and abroad, how, at great cost, made land has been excavated for docks, and encroachments into tide waters have been taken away to make convenient berths for the giant vessels of modern construction.

United States bulkhead and pierhead lines have been established by the Secretary of War on Mystic and Chelsea rivers. Filling is allowed as far out as the bulkhead line, and beyond only structures on piles are permitted to the pierhead line.

If each owner were granted a license to build a pile structure over his entire area, out as far as the pierhead line, all the dock space would be covered, and the berth room for vessels would be limited to the quayage front of the river bank. Within what number of decades the demand may arise for the use of more docks in these locations than would thus be afforded no man can say, but plans of the nature under consideration should be made with reference to the future, both immediate and remote. The Board has concluded it to be for the public interests to require that on all lots with a frontage of 100 feet or thereabouts on the river 50 feet in width should be reserved for a dock, and that no portion of that 50-foot-wide dock between the United States bulkhead and pierhead lines be encumbered by any structures. The full benefits of this plan may not be realized for years; but when the time arrives the necessity for rearrangement and the incidental costs would be spared, and the tendency to maintain a port of low charges preserved.

The pressing necessities of adequately providing for the rapidly increasing commerce of the port of Boston and also facilitating exports of the manufactures of the Commonwealth demand the conservation of the water front to its fullest extent, and its utilization to the utmost possible advantage. To these public rights it is unavoidable that private interests should yield, and submit to a proper regulation of their use.

Cape Cod Canal.

The Boston, Cape Cod & New York Canal Company was chartered by chapter 448, Acts of 1899, to construct and operate a ship canal between Barnstable Bay and Buzzards

Bay, subject, in certain particulars, to the approval of the Board of Railroad Commissioners and the Board of Harbor and Land Commissioners, sitting jointly or separately, as and for the purposes in the act prescribed.

On June 14 a petition was received from the Canal Company for authority to issue stock and bonds. After due publication of notice, a hearing on the petition was given by the joint Board, at the office of the Railroad Commissioners, and the Canal Company was authorized to issue $140,000 in stock and $140,000 in bonds, as soon as a deposit of $200,000 should be made with the Treasurer of the Commonwealth, to reimburse the company for the deposit so made, and to provide means for making the deposits and payments to the county of Barnstable and the towns of Bourne and Sandwich, as provided in said act, and for defraying the necessary costs incurred in making the surveys and plans for the location and construction of the canal, as authorized by its charter. A copy of the order is as follows: —

In Board of Railroad Commissioners and Harbor and Land Commissioners, sitting as a Joint Board, June 26, 1899.

In the matter of the petition of the Boston, Cape Cod & New York Canal Company for the approval by the said joint Board, under chapters 448 of the Acts of 1899 and 462 of the Acts of 1894, of an issue of capital stock by said company to the amount of $6,000,000, and also of an issue of bonds by said company, to the amount of $6,000,000, for the purpose of building and equipping a ship canal, and of defraying the cost and expense incident thereto, as set forth in said petition, —

It appearing, after public notice and hearing, that said company has been chartered by said chapter 448 of the Acts of 1899 for the purpose of constructing and maintaining a ship canal extending from Buzzards Bay to Cape Cod or Barnstable Bay, through the towns of Bourne and Sandwich, or either of them, with a required capital stock of $6,000,000, and with authority also to issue bonds not to exceed its capital stock at the time actually paid in; and

It being deemed by the said joint Board that an issue of capital stock and an issue of bonds by said company to an amount not to exceed $6,000,000 each, to be issued from time to time as here-

inafter provided, may be reasonably requisite for the purposes for which such issues have been authorized as aforesaid, it is —

Ordered, That the said joint Board approve an issue by the said Boston, Cape Cod & New York Canal Company, subject to the provisions of all general and special laws applicable to such issue, of not to exceed in the whole 60,000 shares of its capital stock, amounting at the par value thereof to $6,000,000, and of not to exceed in the whole at the par value thereof $6,000,000 of its bonds, payable at periods not exceeding fifty years from the date thereof, with interest at a rate not to exceed 6 per cent. per annum, and secured by a mortgage of its franchise, canal, equipment and all of its property, real and personal; the said stock and bonds, or the proceeds thereof, to be applied to the purposes set forth and specified in said chapter 448 of the Acts of 1899, and to no other purpose; and the issues of the said stock and bonds to be made in the manner and upon the terms and conditions following, and not otherwise: —

1. The capital stock of said company shall be duly subscribed, and said company shall be duly organized, and its corporate organization shall be duly maintained, as regards the choice of officers and otherwise, in the manner provided in the general laws of this Commonwealth relating to railroad corporations. It shall have its office and hold its meetings in this Commonwealth; and its books, records and contracts shall be submitted to said joint Board whenever requested by it for examination.

2. No shares of stock or bonds shall be issued except upon payment of the par value thereof in cash, or in payment for labor performed and material furnished in construction, or in payment for property acquired, or to provide means for funding its floating debt, or for the payment of money borrowed for any lawful purpose, as authorized by said chapter 448 of the Acts of 1899.

3. All certificates of stock and all bonds of said company shall be certified and issued only by and through the New England Trust Company of Boston, or some other Massachusetts trust company approved by said joint Board, under an indenture of trust of which the terms and conditions have been also so approved; and the same trust company shall be made the trustee in the mortgage securing the bonds.

4. Upon the due authorization by votes of the stockholders of said Canal Company of issues of its capital stock and mortgage bonds to the amounts aforesaid, and upon the due execution and delivery of such indenture of trust and mortgage, said Canal Company may execute and deliver to such trust company its certificates

of stock and mortgage bonds to an amount not exceeding at par $6,000,000 each; but the said certificates of stock and bonds shall be certified and issued by such trust company only as follows: —

(1) Stock to the amount of $140,000, and bonds to a like amount, shall be certified and issued to said Canal Company or its order, as soon as a deposit of $200,000 has been made by said Canal Company with the Treasurer of the Commonwealth, in accordance with the provisions of section 23 of said chapter 448 of the Acts of 1899; the said stock and bonds, or the proceeds thereof, to be applied to the following purposes and to no other, namely: to reimburse the company for the deposit made as aforesaid, to provide means for making the deposits and payments required by sections 14 and 20 of said chapter 448, and to defraying the necessary cost incurred in making surveys and plans for the location and construction of the canal authorized by said chapter.

(2) Said trust company may certify and issue in like manner such further amounts of stock and bonds, not to exceed in the aggregate (including the issues above mentioned) $6,000,000 each, as from time to time, on the application of said Canal Company, shall have been approved and certified by said joint Board, in the manner provided in chapter 462 of the Acts of 1894, as reasonably requisite to enable said Canal Company, promptly and in good faith, to carry out the purposes set forth and specified in said chapter 448 of the Acts of 1899: *provided*, that the total amount of bonds so approved, certified and issued shall at no time exceed the total amount of capital stock then actually paid in and outstanding as aforesaid.

JOHN E. SANFORD,
GEORGE W. BISHOP,
HERSEY B. GOODWIN,
Railroad Commissioners.
WOODWARD EMERY,
CLINTON WHITE,
Harbor and Land Commissioners.

Later an application was made to the joint Board to modify the order, and permit the issue of the total amount authorized by the charter, to wit, $6,000,000 in stock and $6,000,000 in bonds; provided, that such total issue should be placed in the hands of a trust company, there to remain intact until the canal was completed to the satisfaction of the Board. The desired modification was refused, on the ground that the requirements of approval and certification of the joint Board

were limited by the provisions of chapter 462 of the Acts of 1894, which read as follows: "shall hereafter issue only such amounts of stock and bonds as may from time to time, upon investigation by the board . . . be deemed and be voted by them to be reasonably requisite for the purposes for which such issue of stock or bonds has been authorized."

On September 28 the Canal Company deposited $200,000 with the Treasurer of the Commonwealth, and filed with the Harbor and Land Commissioners plans of the proposed location and of the proposed construction of the canal, as required by its charter. After due notice a hearing was given on November 28 to the parties interested, that being as early as the representatives of the Canal Company could conveniently attend, and the hearing was continued to December 19, at the request of the Canal Company, to await the return of its engineers, who were still absent.

Boat Harbors.

The policy of providing boat harbors where the call for them is such as to justify their cost continues to find favor with the public. The direct advantage from the increased attractiveness of a seashore place that furnishes a good harbor for boating is obvious, and the attraction of those now built and in process of building has already created a demand for them elsewhere. The Board wishes to emphasize the fact that these boat harbors on the sandy shores of the coast are still more or less of an experiment, and it would be wise to suffer a sufficient time to elapse to test the work of the Board, and to furnish data for making changes, if necessary, before progressing far in this direction. Every application should receive the severest scrutiny; and, owing to the unavoidable uncertainties connected with every project of this kind, none should be undertaken without first securing such information as can be obtained from a careful survey and estimate of the cost.

Green Harbor.

Previous to 1871 the harbor was formed by the lower portion of Green Harbor River, a small stream in the southeasterly portion of the town of Marshfield, with a water-shed

of about 7½ square miles, 1,500 acres of this being salt marsh lying next to the banks of the river. It empties into the ocean through a sand beach at its northerly end, where it joins the upland. The outlet is so protected on its north-easterly side by rocks and ledge that it appears to have no tendency to move along the beach. Up to 1871 the harbor was said to have a depth of about 14 feet, while over the bar there was about 2 feet at mean low water. In 1872 a dike, authorized by chapter 303 of the Acts of 1871, was built about one-half mile above the mouth of the river, which greatly reduced the volume of the tides and the rapidity of their ebb and flow. As a result, the sand was gradually driven into the harbor below the dike, practically filling it up, and leaving only a narrow channel, whose bottom was above the level of low water along its northerly and easterly sides. An appropriation of $67,000 was made by chapter 469 of the Acts of 1898 for the improvement of this harbor, and plans and specifications were prepared for the work. These provided for two stone jetties, one on either side of the outlet, with an opening of about 200 feet between their outer ends. The jetties consist of large, irregular-shaped blocks of granite, the blocks being deposited from the vessels and allowed to make their own beds, the outer ends of the most exposed portions having a side slope of 2 to 1, the faces next the channel having a side slope of 1 to 1, and all other portions 1½ to 1, the main portion of the jetties being built up 2 feet above mean high-water mark, with a width of 5 feet on top, the outer ends carried 4 feet higher, to serve as beacons at the entrance.

The jetties were completed early in the fall, at a cost of $33,256.93 and already the tidal currents have scoured out the sand from a portion of the channel, depositing it near the outer ends of the jetties, increasing the navigable depth, but forcing the low-water line a little farther out to sea.

During the summer plans and specifications were prepared for building a timber training wall to deflect the current from Cut River, so that it should pass out directly through the Narrows, instead of running across the harbor and obstructing the flow in the channel of the main river. A contract for the construction of this work was made with Augustus

Bellevue & Co., Oct. 16, 1899. Owing to delay in completing the jetties, it is deemed advisable not to make any contract for the dredging of the channel and anchorage basin until next spring, in order that opportunity be given to study the changes which may occur through natural causes during the fall and winter. The channel between the Narrows and the sea has been deepened by the scour of the current, and it is anticipated that the changes which are occurring will facilitate the work of dredging to be undertaken later, when it is proposed to excavate a portion of the sand from the interior of the harbor for the purpose of an anchorage for boats, and to excavate a channel from this basin out between the jetties to a depth of 4 feet at mean low water.

So far, results are satisfactory and in accordance with the anticipations of the Board.

Lake Anthony.

Under the appropriations authorized by chapter 441 of the Acts of 1898 and chapter 155 of the Acts of 1899 for the improvement of this harbor, plans and specifications were prepared for dredging a channel through the beach into the lake 100 feet wide on the bottom, with a depth of 5 feet at mean low water; the sides of the cut sloping up on an angle of 5 to 1; the entrance to be protected by two stone jetties extending from the top of the beach into the sound about 200 feet beyond the low-water line, reaching a depth of about 8 feet at mean low water. These jetties are built of granite quarry grout, and are 5 feet wide on top, 5 feet above mean low water, with sides sloping 1 to 1 next to the channel and 1½ to 1 on the exposed face; the slopes of the outer ends are on an angle of 2 to 1, the top being 10 feet in diameter at the level of the main jetty, and built up above this, with vertical sides, to a height of 4 feet, to serve as a beacon or day mark at the outer ends.

The contract for the stone work was awarded July 5, 1899, to Eugene S. Belden of Hartford, Conn., the lowest bidder, for $2.23 per ton. Work was at once commenced, but, owing to the weather, was not finally completed until November, 1899. There were placed in the structure 5,858 tons

of stone, at a total cost of $13,063.34. A contract was made with the Bay State Dredging Company to excavate the channel for the sum of $6,000. Work commenced at once, and was completed in a satisfactory manner Oct. 24, 1899. The material excavated consisted of fine gravel and sand, and was deposited on the beach on both sides of the channel, raising the level of the beach so as to form a ridge too high for any waves to break over, thus forming a protection to the harbor. All the work contemplated by the plans has now been completed, at a total cost, including surveys and engineering, of $19,627.13. The channel has a depth of not less than 5 feet at mean low water throughout its length and a width of 100 feet on the bottom. The current is sufficient to prevent seaweed and other materials from lodging there, but is not strong enough to interfere with boats beating in and out in a fair sailing breeze.

Already this place has served as a harbor of refuge for a schooner drawing 6 feet, and a pier and boat landing has been licensed, with a view to next season's enjoyment of the new and increased facilities for pleasure boating.

Osterville.

Work under the contract with George H. Cavanagh has been prosecuted steadily, with the exception of a short time when the bay was frozen over. The timber jetties were completed in August, and the excavation of the channel has progressed to such an extent that it was used for the passage of boats during the summer season. At the present time the larger part of the channel has been excavated, and there is now nearly as great a depth of water through this channel as there is over the bar at the entrance to Cotuit harbor. Owing to the necessity for making some changes in the dredging plant, work has been discontinued until next spring, but it is expected that the channel will be navigable to its full width before the yachting season opens.

It was deemed advisable to strengthen the outer end of the jetties with stone riprap, and this was done during November. Three hundred and twenty-three tons of stone were deposited, at a total cost of $969.

Careful watch must be kept of the action of worms on the

timber work, and the jetties should be reinforced with stone before the timber is so weakened as to be liable to destruction from heavy waves.

Menamsha.

An additional appropriation having been made by the Legislature for strengthening the timber jetties at Menamsha Inlet, where they mark the boundary line between the towns of Gay Head and Chilmark, plans and specifications were prepared early in the spring for that purpose. The contract for the work was awarded May 11, 1899, to Eugene S. Belden of Hartford, Conn., the lowest bidder, for $2.33 per ton. Work commenced at once, and was completed by July 3, 1899, 2,110 tons of stone having been placed in the jetties, at a total cost of $4,916.30.

The jetties as now built have forced the current in the inlet to run nearly at right angles with the shore, instead of nearly parallel to it at the outlet, thus scouring out a navigable channel between the jetties having a depth of not less than 2.5 feet at mean low water for a width of over 30 feet. There is greater depth here than is found in the channel above between the entrance and the wharf, and such as will allow nearly all boats which are used in that vicinity to enter the harbor far enough to be in safety at all stages of the tide, although some of them cannot at low water reach the landing places.

Scorton Harbor.

The great storm of November, 1898, added to the work done under last year's contract, widening the cut, but not materially deepening it, except at the inner end, where the banks consisted of salt marsh which is not readily eroded; there the current has materially deepened the cut. Since then the action of the tides has gradually washed out the accumulation of mud in the main river and creeks through the marsh, increasing their navigable depth. This material has in all probability been washed out into the ocean, as no traces can be found on the marshes. At the present time the harbor is used by fishermen and lobstermen, but they can enter and leave only when the water is above the level of half-tide. The marshes and cranberry bogs have been thoroughly drained.

During the past year sand has begun to accumulate on the westerly side of the outlet, and is gradually forcing the mouth of the river to the eastward, and in all probability will eventually drive it back into its old position, so that its lower reaches will run parallel with the shore, with the sand ridge lying between it and the ocean; but it will probably be a generation or two before it will reach the situation in which it was found in 1897.

Surveys.

The amount of work done by the engineering force has been much larger in the past year than for a long time. Three additional assistants and two additional inspectors have been employed throughout the summer, and one of the assistants is still engaged. Almost the whole force has been employed in connection with the construction of the Commonwealth pier, the paving of Fargo Street and other work on the South Boston flats; also in connection with the construction and improvement of the various boat harbors for which appropriations were made by the Legislature, and on surveys of other harbors under special acts. Accordingly no progress was made during the year on the re-survey of the Mystic River, which has been progressing slowly for the last few years. This work should be pushed forward more rapidly the coming year, as the plans are required for the use of the Board.

Inquiries made at the office as to the location of harbor lines, depth of water in various places, location of structures, and for other information which is found in the archives of the Board, are increasing, and take up much valuable time.

The following surveys have been made during the year: —

February 28, survey of the fronts of the buildings on the north side of Boylston Street, near Berkeley Street on the Back Bay, in Boston, to determine to what extent projections had been made in violation of restrictions in the deeds of the property from the Commonwealth.

March 13 to 31, soundings were taken over the portion of South Bay east of the New England Railroad and north of Swett Street.

May 8 and 9, survey at Winthrop, to locate the lines of the

channel which was to be excavated under contract with the Bay State Dredging Company.

April 15, survey of wharf at 400 Atlantic Avenue, with soundings, to determine the amount of tide water which the owners proposed to displace in making improvements.

June 10, survey of a portion of Lincoln wharf in Boston, with soundings, to determine the amount of tide water which the Boston Elevated Railway Company proposed to displace in constructing its new power station.

July 8 to 15, survey of the new mouth of North River in Scituate, which was created by the great storm of November, 1898.

July 24 to 29, survey of a portion of Green Harbor River, below the dike, to determine the changes which had taken place during the construction of the jetties at its mouth.

July 31, soundings in South Bay, to determine the extent of the channel which had been dredged in front of the wharves of the Roxbury Central Wharf Company.

August 25 and 26, survey at Green Harbor, to mark the location of the training wall to be built at the mouth of Cut River, and to locate the lot of land owned by the Commonwealth at the inner end of the western jetty.

October 14 to 20, survey and soundings at Osterville, to locate channel which had been dredged by George H. Cavanagh under his contract with the Commonwealth.

November 8, survey and soundings of the channel at the entrance to Menamsha Inlet, on the boundary line between the towns of Gay Head and Chilmark.

November 9 and 10, surveys and soundings of the channel which has been excavated at Cottage City between Lake Anthony and Nantucket Sound.

November 27 to 29, survey to locate the harbor line on the wharves which have been built on the north-westerly side of East Boston.

The results of the surveys have been recorded on suitable plans, and the data thereby furnished has been used in preparing plans and estimates required by the Board.

Numerous examinations have been made from time to time of structures built under licenses from the Board, and

calculations made of the amount of tide water displaced by the same, as a basis for the compensation charge under chapter 19 of the Public Statutes.

Witchmere Harbor.

By chapter 96 of the Resolves of 1899, the Board was directed to make surveys and prepare estimates for improving the entrance of Witchmere harbor in Harwich, Lewis Bay in Barnstable and Yarmouth, and East Bay in Barnstable, and a special appropriation of $1,500 was made for this purpose.

In June a survey was made of Witchmere harbor. A plane-table survey was made of the shore lines of the harbor and its surroundings, together with the shore of Nantucket Sound, for a distance of about 1,100 feet on either side of the entrance to the harbor. Soundings were taken over the whole area of the harbor and its entrance channel, and in the sound on both sides of the entrance and extending out about 2,000 feet from the shore. The harbor proper consists of a pond, having an area of about 13.5 acres, and is nearly circular in shape. This is connected with the sound by a channel about 30 to 40 feet wide and 700 feet long, having a navigable depth of about 1 foot at mean low water. At the entrance the tide has a mean range of about 3.5 feet. During the past ten or fifteen years the local authorities have spent considerable sums in straightening and deepening the entrance channel and protecting its mouth by stone and wooden jetties. From statements of the selectmen and others it was learned that this harbor is the home port for the boats used as tenders for the lightships stationed on the shoals near Monomoy, as it is the nearest point where they can reach a safe anchorage.

The wooden jetties first built were quite effective in protecting the entrance while they lasted; but storms, ice and sea worms destroyed them in a few years. The jetty on the western side of the entrance has been partially replaced by a stone one; but the means at the disposal of the local authorities were not sufficient to extend this far enough to fully protect the entrance from the sand which drifts from the west, and practically nothing has been done in recent years

to protect the eastern side, from which direction large quantities of seaweed are annually driven into the harbor.

Upon the completion of the surveys it was found that directly opposite the present entrance and for a considerable distance to the east, shoal ground having less than 3 feet at mean low water extended for a considerable distance from the shore, while immediately to the westward of the present entrance the 3-foot curve approached within 200 feet of the high-water mark. It was seen that by excavating a channel on the westerly side of the existing stone jetty the entrance into the harbor would be considerably straightened, and deep water would be reached in less than half the distance from the shore than through a channel on the easterly side of this jetty. A plan was therefore devised for extending the existing stone jetty a distance of about 230 feet, and building a new stone jetty parallel with this one and about 100 to 150 feet farther west. Between these jetties a channel could be excavated 50 to 75 feet wide on the bottom, 3 feet deep at mean low water, and extending from the sound through into the pond, where there is an area of about 8 acres with a depth of over 3 feet at mean low water. This channel was estimated to cost not less than $15,000, as follows: —

3,280 tons of granite quarry grout deposited in place, at $2.50,		$8,200 00
12,350 cubic yards of excavation, at $0.45,		5,557 50
	$13,757 50	
Ten per cent. for engineering and incidental work,	1,375 75	
Total,		$15,133 25

After making these estimates, consultation was had with the selectmen of Harwich and other citizens interested in the matter, and they stated that the sanitary condition of the harbor was such that it was of great importance to have something done at once; also that the inhabitants would be fully satisfied for the present if such structures could be built as would result in maintaining the channel at its existing width and depth.

The situation seemed critical, as the place had begun to attract summer residents, a number of cottages had been

built, and others were under consideration; but the offensive odors from the decaying eel grass had become so potent as to threaten to drive away visitors, unless something was undertaken forthwith in earnest of the intention to mitigate the nuisance.

For these reasons a modified plan of improvement was adopted and carried out under the provisions of chapter 463 of the Acts of 1899. The plan provided for extending the existing stone jetty on the westerly side of the entrance about 150 to 200 feet, and for building a timber jetty of oak piles and spruce lumber, similar to the one already built at Osterville, about 250 feet long, on the easterly side of the entrance parallel with and 100 feet easterly of the stone jetty; the outer end of the timber jetty to be strengthened by having stone riprap piled around it.

A contract for the construction of the timber jetty was awarded to George H. Cavanagh, Sept. 21, 1899, for the sum of $1,800, and the work was completed satisfactorily Nov. 17, 1899. A contract for the stone jetty was awarded to Eugene S. Belden, for $3 per ton. On Dec. 1, 1899, about 600 tons of stone had been placed in the work, but, owing to the lateness of the season, the completion of the stone work will be delayed until next spring.

These structures are designed to maintain the existing width and depth of the channel, and to prevent obstruction by sand, which is annually driven into it from the beach to the westward by the winter storms, and also to prevent the seaweed from driving into the harbor, where it decays and settles, shoaling the water and emitting odors detrimental to health. The construction of the timber jetty has already substantially accomplished this last purpose, and it is anticipated that the portion of the stone jetty which has just been built will prevent the sand from driving in to any extent from the beach to the westward, and that both structures will have a tendency, by training the ebb and flow of the tides, to deepen the channel. It is estimated that the total cost will not exceed $5,000.

Lewis Bay.

A survey of Lewis Bay was made in August and September. A plane-table survey was made of the shore lines and their surroundings from Harbor Bluff up to the village, the balance of the topography being taken from the latest chart of the United States Coast and Geodetic Survey. Soundings were taken over the whole of the bay inside of Egg Island and out into the main harbor of Hyannis to a line beyond the entrances of the two channels leading into Lewis Bay. The survey shows that there is an area of about 377 acres in the main portion of the bay, having a depth of not less than 6 feet at mean low water, and a considerably greater depth over the larger portion of it. This area of deep water is connected with the main harbor of Hyannis by two channels, known as the main channel and the "drain." The main channel is located substantially parallel with and about 500 feet northerly of the promontory known as Point Gammon. It has a depth of not less than 6 feet at mean low water, over a width varying from about 100 feet to 300 feet. About midway between the ends of this channel a shoal or sand bar makes out from the Point Gammon shore, and forms a serious obstruction to boats and vessels passing through it. Near the outer end also a shoal makes out from the northerly side of the channel, but does not offer as great an obstruction to navigation as the one first mentioned. The "drain" is located on the north-westerly side of Egg Island, and about midway between the island and the main land at Hyannis. This channel is straighter than the main channel, but is not as wide or deep. It has an average width of about 100 feet, with a depth of not less than 6 feet at mean low tide, excepting at the outer end and at a point about 1,000 feet therefrom, where bars extend across the channel, having a depth of a little over 5 feet on them at mean low tide. This channel is located throughout its length at a considerable distance from the land, and, even if as large as the main channel, would be, from its location, more difficult to find unless it were properly buoyed. Most of the landings in the bay are located in the arm extending from Harbor Bluff up into the village.

This arm is composed of two small basins; the outer one has an area of about 155 acres, with a depth of water varying from 6 to 11 feet at mean low tide, and a width of about 200 feet at its narrowest point. Between this deep water and that in the main portion of Lewis Bay there is a bar 300 feet wide, with a depth over it of a little more than 4 feet at mean low water. Between the outer and inner basins is what is known as "The Narrows." The natural channel connecting these had a navigable depth of a little over 1 foot at mean low water for a width of about 50 feet. Within a few years an artificial channel has been cut through the bar or sand pit on the easterly side of the natural channel, forming an artificial channel about 30 feet wide, with a depth of a little over 4 feet at mean low water. Within this inner basin is an area of about 2 acres, with a depth of over 6 feet at mean low water.

The Hyannis Yacht Club has a club house and wharf at the inner end of this basin, and there are a number of other boat landings on the shores of both basins. The mean rise and fall of the tide at Hyannis is about 3 feet, and the whole bay is completely landlocked. It would afford excellent shelter for any vessels which could reach it, but, owing to the shallow water, only small craft can be accommodated.

Estimates for 6 and 8 foot channels have been made. The main channel from the outer harbor into the bay is longer than the "drain," and, while it will not require a very large expenditure to dredge away the two points or bars, previously mentioned, to the depth of 6 feet at mean low water, no estimates for the improvement of this channel to any greater depth have been made; believing that, if it is desired to have a depth of 8 feet, better results can be obtained by deepening and enlarging the "drain" than by improving the main channel. In the estimates for improving the "drain" the width of the channel has been fixed at 200 feet on the bottom, at depths of 6 and 8 feet respectively. In following as nearly as practicable the natural course of this channel, one bend only has been projected. In improving the channel in the bay, the width has been fixed at 200 feet on the bottom up to "The Narrows," so called, where the present artificial channel exists. Through "The Narrows" and up to the

wharf a bottom width of 150 feet has been fixed. Estimates for this channel are given for a depth of 6 feet and also of 8 feet.

ESTIMATES.

Channels from the Sound into Lewis Bay.

Improving main channel between Egg Island and Point Gammon: —	
Excavation to depth of 6 feet at mean low water, 11,000 cubic yards, at 35 cents,	$3,850 00
Engineering and contingent expenses,	500 00
	$4,350 00
Improving "drain": —	
200 feet wide, 6 feet deep at mean low water, 13,000 cubic yards, at 35 cents,	$4,550 00
Engineering and contingent expenses,	500 00
	$5,050 00
200 feet wide, 8 feet deep at mean low water, 60,400 cubic yards, at 35 cents,	$21,140 00
Engineering and contingent expenses,	2,110 00
	$23,250 00

Channel through the Bay to the Wharves.

Improving channel through inner basins, 6 feet deep at mean low water, 200 feet wide up to "The Narrows," 150 feet wide to wharf: —

To "The Narrows,"	3,000 cubic yards	
Through "The Narrows,"	13,900 cubic yards	
To the wharf,	8,100 cubic yards	
	25,000 cubic yards, at 45 cents,	$11,250 00
Engineering and contingent expenses,		1,125 00
		$12,375 00

Same as above, but 8 feet deep at mean low water: —

To "The Narrows,"	19,000 cubic yards	
Through "The Narrows,"	18,200 cubic yards	
To wharf,	14,200 cubic yards	
	51,400 cubic yards, at 45 cents,	$23,130 00
Engineering and contingent expenses,		2,320 00
		$25,450 00

The difference in cost between 6-foot and 8-foot channels from the sound to the wharves through the "drain," so called, appears from the estimates to amount to $30,775. The Board is inclined to the opinion that the shallower chan-

nel with the depth of 6 feet at mean low water would sufficiently meet the demands of this locality for all ordinary enjoyment of fishing and pleasure sailing. While the opportunity for making a safe and commodious harbor for coasting vessels undoubtedly exists, that function is one pertaining to the federal government, and should be brought to the attention of Congress, in order that a proper survey and report might be made thereon.

East Bay.

A survey of East Bay at Osterville was made in September and October, after the completion of the field work at Lewis Bay. A plane-table survey was made of the shore line of the bay and of the portion of the sound between the wharf at Wianno and the Gaff boat landing, nearly a mile northeast up the coast. Soundings were taken over the whole bay and over the portion of the sound lying between the wharves above mentioned, out to a depth of 12 feet at mean low water. The bay itself covers an area of about 88 acres, and Centreville River, with its tributaries, whose waters flow into the bay, covers a slightly larger area. The mean range of the tide in the sound in this locality is about 3 feet. The greatest depth of water in the bay is about 4 feet, and the area having a depth exceeding 3 feet at mean low water is about 9 acres. The Centreville River has an average width of about 200 feet, with a narrow channel having from 3 feet to 4 feet of water at mean low tide, extending for a considerable distance beyond the limits of the survey. The outlet from the bay into the sound is through a shifting sand beach.

In 1846, the date of the first survey by the United States Coast and Geodetic Survey, the opening was located nearly opposite the middle of the bay. Since that time, through the action of natural forces, it has gradually worked to the eastward, the current cutting away the sand on the easterly side, and the wind and waves building up the westerly bank with the shifting sand, so that now the outlet channel is about 1,200 feet long, and is separated from the sound by a narrow ridge of sand.

Lying between this channel and Centreville River is a narrow neck of sand and marsh, which has already been

broken through by the waves in two places, so that at extreme tides the water flows across the marsh. The current in the outlet is sufficient to maintain a narrow channel having a depth of over 3 feet at mean low water; but at the point where it discharges into the sound the current is dispersed and the water spreads out over the flats, so that there is less than 1 foot in depth at mean low water in the channel across the flats, making it practically impossible to enter the bay with a boat drawing 2 feet or more, except at or near high water.

Opposite the present outlet a shoal extends some 1,300 feet from the shore, with a practically level surface, and having a depth of less than 1 foot at mean low water. Within the next 100 feet the water deepens rapidly to a depth of over 12 feet at mean low water. Toward the west the 12-foot contour rapidly recedes from the shore, until at a point about opposite the westerly side of the bay it is 2,400 feet from the shore, but here the bottom slopes gradually to the 12-foot contour. For this reason, plans and estimates have been made for two different channels. The first channel is located about opposite the middle of the bay and nearly at right angles to the general trend of the shore, to extend from a depth of 3 feet in the bay to 3 feet in the sound, to be 100 feet wide on the bottom, with side slopes of 5 to 1, to be protected at the entrance by two stone jetties located one on each side of the channel and extending from the crest of the beach into the sound to a depth of 4 feet at mean low water. These jetties would be about 1,100 feet long, and their construction would require about 13,700 tons of stone. The excavated channel would be about 1,600 feet long, and would require the removal of about 9,500 cubic yards of material. This plan is designed to provide an entrance to the harbor which will admit any boat such as is now used in this vicinity and as large as the present depth of water in the bay will accommodate.

The second channel is located from the bank at the outer edge of the flats opposite the present entrance channel, and is to extend nearly due west to a point near the westerly side of the bay, near a suitable location for a wharf readily accessible from the highway along the south-westerly side of the bay. This channel would be 10 feet deep at mean low water,

and have a width of 150 feet on the bottom, with side slopes of 5 to 1. It is designed to admit coasting vessels of considerable size, but, owing to the shallowness of the bay, it is necessary to extend the channel as above stated entirely across it. This channel is not designed as a harbor of refuge, but simply to enable the smaller class of coasting vessels to run here for the purpose of bringing coal, building materials and such other general merchandise as is required by the inhabitants. The entrance to this channel would be protected by two stone jetties, each about 1,600 feet long, and 20,000 tons of stone would be required in their construction. The excavated channel would be about 3,700 feet long, and would require the excavation of 192,000 cubic yards of material.

Estimates of the costs of the two projects are as follows: —

Channel 3 feet deep, 100 feet wide: —	
Excavation, 9,500 cubic yards, at 45 cents,	$4,275 00
Jetties, 13,750 tons, at $2.50,	34,375 00
	$38,650 00
Engineering and contingent expenses,	3,850 00
	$42,500 00
Channel 10 feet deep, 150 feet wide: —	
Excavation, 192,000 cubic yards, at 35 cents,	$67,200 00
Jetties, 20,000 tons, at $2.50,	50,000 00
	$117,200 00
Engineering and contingent expenses,	11,800 00
	$129,000 00

The great cost of either of these projects would seem to preclude them from consideration at the present time, if not altogether, as beyond the limit of commensurate benefit, relatively to expenditures for like purposes elsewhere.

The following table shows the amount of work which was done on the survey of these three harbors, and the cost thereof: —

Witchmere Harbor.

Shore line surveyed (miles),	1.8
Lines of soundings run (miles),	6.07
Number of soundings taken,	1,448
Lines of levels run (miles),	.5
Tide gauges established,	1

Lewis Bay.

Triangulation stations occupied,	14
Triangulation stations determined,	29
Shore line surveyed (miles),	3.42
Lines of soundings run (miles),	68.27
Number of soundings taken,	15,703
Lines of levels run (miles),	.5
Tide gauges established,	12

East Bay.

Shore line surveyed (miles),	4.14
Lines of soundings run (miles),	19.06
Number of soundings taken,	4,111
Lines of levels run (miles),	3.4
Tide gauges established,	8
Total cost of the three surveys,	$1,503 64

New Bedford Harbor.

The improvement by the federal government is progressing. A channel, 250 feet wide and 18 feet deep, has been excavated from the main channel through the new drawbridge, and the work above is going on.

Woods Hole Channel.

The project of the federal government at Woods Hole contemplates giving a channel 300 feet wide, with a depth of 13 feet at mean low water. It is estimated to cost $396,000. This is a much-needed improvement and will greatly facilitate the passage of vessels of increased size between Buzzards Bay and Vineyard Sound. The swiftness of the tide, currently reported to be as high as 8 knots, in conjunction with the rocks and the deviousness of the channel, has heretofore rendered navigation through the channel both difficult and perilous. The result of this improvement, which it is expected will be completed in the spring or early summer, will be to greatly encourage the use of a most convenient passageway for pleasure as well as for business.

Vineyard Haven.

During the great storm of November, 1898, the greatest number of marine disasters at any one place on our coast occurred at Vineyard Haven, where many vessels had sought

shelter to ride out the storm. Some forty-two schooners and barges, together with a barkentine, were either sunk at their anchors, driven ashore, dismasted or badly damaged. Fifteen men were rescued from the rigging of vessels at great peril to the rescuers, and one man died before assistance arrived.

It is the only large harbor between Provincetown and Newport, and is in the direct line of coastwise traffic between New York and Boston for all vessels going through the sound, the greater part of which are sailing craft and coal barges in tow, and they frequently seek refuge in this commodious haven.

It has a wide entrance of more than a mile and an anchorage area of about 757 acres, with over 18 feet of water at low tide, unobstructed by shoals or ledges. There are no obstructions of any kind to contend with or to make it difficult for sailing vessels to manœuvre in bad weather. The bottom affords good holding ground, — a feature of the utmost importance. It is well protected from gales from every quarter except the north-east, although that unfortunately is the direction from which the heaviest storms of winter come. As this harbor offers no protection in north-easters, mariners must either run for Newport, 45 miles away, or Chatham Roads, 32 miles distant, unless they can find shelter in Tarpaulin Cove or Hyannis, or under the lee of Falmouth. All these places, however, are open to the south, and if the wind should shift to that direction, vessels anchored there would be obliged to take the full force of the storm.

The great disaster of the November storm had brought these conditions and the improvement of this harbor to the careful attention of the Board; but further consideration of the question was rendered unnecessary when it was learned that the rivers and harbors act of the last session of Congress called for an examination of this subject by the War Department. In pursuance of this matter Major Lockwood, the United States engineer in charge of the district, has made a recent report, recommending that a board of engineers be appointed to make a thorough study of Nantucket and Vineyard sounds, with reference to the location of proper harbors of refuge therein.

Connecticut River.

The matter of improving the navigation of the Connecticut River as far as the cities of Springfield and Holyoke is in temporary abeyance.

In December last, in pursuance of the requirements of chapter 104 of the Resolves of 1898, the chairman of the Board, in company with a delegation from Springfield, visited Washington and appeared before the rivers and harbors committee of Congress, and advocated the projected improvement of navigation of the river above Hartford, Conn., as set forth in the special report of the Board to the Legislature in January, 1898. The congressional committee reported in favor of a more extended survey and examination, and the bill passed the House of Representatives, but was stricken out of the rivers and harbors bill in the Senate. There is a strong association of prominent citizens of the Connecticut valley organized for the purpose of urging this improvement before Congress. It is a project worthy of completion, and no effort should be spared in the interests not only of the Massachusetts cities and towns on the Connecticut River, but of the whole Commonwealth, in the endeavor to realize the benefits which would necessarily result therefrom.

The attention of the Board has been called to the erosive effects of the last spring freshets at the "High Banks" in the town of Hadley. If the Legislature should again make an appropriation, as heretofore, at Hadley, West Springfield and Agawam, the river may be kept within its present banks, and property saved from destruction.

If $1,000 is appropriated, as in 1896, by chapter 77 of the Resolves of that year, for the purpose of continuing a general survey of the river within the Commonwealth, as projected in chapter 344 of the Acts of 1885, the results cannot fail to be valuable as a contribution to the records of the counties and to the scientific data of the Commonwealth.

Great Ponds.

In the Great Ponds of the Commonwealth there are islands of which the ownership is unknown. They are gradually becoming more or less valuable, as their utility for different

purposes becomes appreciated. There are several such islands in the ponds on Martha's Vineyard, also in Plymouth and Essex counties, and perhaps elsewhere in the State. In pursuance of its duty to ascertain the location, extent and description of the lands belonging to the Commonwealth, and to investigate her title thereto as required by Public Statutes, chapter 19, section 3, and chapter 144 of the Acts of 1886, the Board has taken steps to assert the ownership of the Commonwealth over such as it is informed are unclaimed, and to ascertain the title to those in doubt.

All the Great Ponds should be surveyed, and a record thereof made. A small annual appropriation for this purpose would enable the Board to accomplish this object within a reasonable time.

Province Lands.

The experience of the past year justifies continued confidence in the success of the undertaking. Notwithstanding the unusual violence of the winds during the last twelve months, the sand has remained in place over the planted areas, and the vegetation has not materially suffered. The work of the year has gone on as usual. About the first of April the planting began along the slope of the southern range of sand hills, where it was left at the close of last season, and a considerable quantity of growing trees and shrubs were transplanted, comprising several varieties of pines, besides poplars, Scotch broom and bayberry. Grass planting was begun at the last of the month, but the unusual drought of the early spring necessitated a discontinuance of all labor until the autumn. In spite of the severity of the drought, most of the trees and shrubs survived the transplanting and are doing well. There was no measurable rain fall in April and May, and but a slight amount in June.

About the middle of September beach-grass planting was resumed, and continued well into the month of November. Some 35 acres have been covered with beach grass during the season, which is 15 acres more than last year. This makes a total of about 125 acres in all covered up to the present time. Throughout the whole area the grass acts successfully as a sand-binder against the most violent gales, and wherever the grass is lodged the wind has no power to

move the sand. The trees and shrubs are growing, interspersed where wind breaks are desired, and in due time the dunes will be covered with a small forest of vegetation.

Some considerable work has been done toward keeping the roads on the lands safe for travel, but no extension of the road out toward the outside of the Cape has been possible.

Of the liberal appropriation given last winter to cover a period of three years, one-third is now spent, in accordance with the intent of the act.

Fishermen who desire to have huts on the outside of the Cape and land their catch of fish out there, instead of making the long sail or row around Long Point into Provincetown harbor, have been permitted so to do. The only disadvantage which arises therefrom is the serious cutting the road gets from hauling the heavy loads of fish over to town; but the roads are made to be used, and the comfort and benefit to the fishermen are considerable.

During the past year the superintendent, under the direction of the Board, sent notices to all users of cranberry patches and mowing lots, who had not given them up, to call and arrange for a continuance of such use, when not considered detrimental to the public purposes and enjoyment of the land, upon payment of a small fee or tax, which is collected and paid into the State treasury. In this way the products of the soil are not allowed to go to waste under the eyes of those who need them, and the ownership of the Commonwealth receives due recognition.

The report * of the Superintendent of the Province Lands may be found in the Appendix.

Back Bay Lands.

In February the attention of the Board was called to a violation of one of the restrictions in a deed from the Commonwealth of land at the corner of Berkeley and Boylston streets, in Boston. The violation consisted in the erection of a structure in the reserved space between the building line and the sidewalk. Upon notification the owners appeared before the Board and contended that the structure was not of a nature intended to be excluded by the restrictions in the

* See Appendix E.

deed. After consultation, however, the Board concluded that the structure complained of ought to be removed, and so ordered, and the same was removed within the time fixed.

Hangman's Island.

An application was made in January for an extension of the lease of Hangman's Island, in Boston harbor; and the Board, being satisfied that there was no detriment to the Commonwealth and the applicants were proper persons, and that there were public advantages in having the island occupied by responsible parties, executed a lease of the same for a term of three years, at the rate of $50 per year.

Great Storm of November, 1898.

For some time after the great storm of November, 1898, the Board was visited by the selectmen of the towns along the shore where the greatest damage occurred, with a view to obtaining such assistance and advice as, in the nature of things, it was possible and proper for the Board to give. Conferences were held with representatives of Duxbury, Marshfield, Sandwich, Marblehead, Scituate and Harwich, and in consequence thereof the Board through the winter and spring visited the several places to which its attention had been called, with a view to noting personally the havoc of the storm and rendering such assistance as was in its power. The destruction to life and property was excessively severe, and led in some instances to legislative aid, to wit, chapter 463 of the Acts of 1899, being an act to provide for the survey and improvement of harbors, and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth.

At Scituate, as was stated in last years' report, the sea opened a new passage into North River between the third and fourth cliffs. This opening created a new harbor on a dangerous coast, which might well answer the purpose of a harbor of refuge, if in no other respect useful. Consequently the Board had a survey made of the new mouth of this river, which showed an opening of 320 feet between the cliffs and an interior anchorage basin of about 3 acres, with

a depth exceeding 6 feet at mean low water. As soon as this survey was plotted and printed it was freely distributed, with a view to disseminating information valuable to yachtsmen and sailors. It is proper, however, to draw attention to the fact that this is not the first time that North River has emptied into the sea through the opening which at present exists, and that it would not be unnatural for the present opening to be closed by the operations of nature, as it has been before. The soundings which appear on the plan represent the condition at the time the survey was made; but on a shore where the sands are rapidly shifting, and bars to the river mouth have formed before, it must be expected that they will form again. Consequently, while the depths given may be used as guides, they should not, as time passes, be relied upon as accurately measuring the depth of water at any given time in the future. A copy of the above plan is printed herewith.

Wrecks and Obstructions.

During the year the Board has caused the removal of the following wrecks and obstructions, under chapter 260 of the Acts of 1883: —

Schooners "Caroline Knight," "Montezuma," "W. H. Y. Hackett," from South Boston flats; "Mary E. Hagan" from the northerly edge of the main ship channel near the lower middle shoal in Boston harbor.

An obstruction consisting of an old boiler tube partially buried, with an end dangerously projecting, and a piece of an oak pile, was located in Fort Point Channel by a diver and taken out.

A small mud scow found adrift by the harbor master of Boston was moored by him to a dolphin near the Marine Park at South Boston, and reported to the Board. As no ownership could be established, the scow was taken by the Eastern Dredging Company, with the consent of the Board, thus avoiding expense to the Commonwealth.

Each year the Board is called on to remove one or more worn-out or wrecked vessels, abandoned by the owners and left where likely to become dangerous to other vessels. The Board has always taken the ground in removing such wrecks

that the only safe way is to break them up and place them at some point above high-water mark where they cannot by any possibility again get into tide water.

Work of the United States in Rivers and Harbors of the Commonwealth.

The Board is indebted to Col. Charles R. Suter, Corps of Engineers, U. S. A., who is in charge of river and harbor improvements in eastern Massachusetts, and Maj. D. W. Lockwood, Corps of Engineers, U. S. A., who is in charge of similar work in southern Massachusetts, for the following statements, which show the work accomplished in the rivers and harbors of this Commonwealth during the fiscal year ending June 30, 1899: —

Statement of Col. Charles R. Suter, Corps of Engineers, U. S. A.

Boston, Mass., Dec. 4, 1899.

The Board of Harbor and Land Commissioners, Commonwealth of Massachusetts, Boston, Mass.

Gentlemen: — In accordance with your request of Nov. 28, 1899, I have the honor to furnish the following summary of the work done by the United States during the fiscal year ending June 30, 1899, in the rivers and harbors of Massachusetts.

The works of improvement under my charge on June 30, 1899, were: —

1. Merrimac River.
2. Powow River.
3. Newburyport harbor.
4. Essex River.
5. Harbor of Refuge, Sandy Bay, Cape Ann.
6. Gloucester harbor.
7. Manchester harbor.
8. Salem harbor.
9. Lynn harbor.
10. Boston harbor.
11. Chelsea Creek.
12. Mystic River, below mouth of Island End River.
13. Mystic and Malden rivers.
14. Charles River.
15. Weymouth ("Fore" and "Back") River.
16. Town River.
17. Scituate harbor.
18. Duxbury harbor.
19. Plymouth harbor.
20. Provincetown harbor.
21. Chatham harbor.
22. Wrecks.
23. Examinations and surveys.
24. Repair of sea-wall at Marblehead, Mass.

The river and harbor act of March 3, 1899, made appropriations for these works as follows: —

Merrimac River,	$40,000 00
Powow River,	12,000 00
Newburyport harbor,	25,000 00
Essex River,	10,000 00
Harbor of refuge, Sandy Bay,	250,000 00
Gloucester harbor,	40,000 00
Manchester harbor,	5,000 00
Boston harbor,	75,000 00*
Mystic River, below Island End River,	50,000 00
Mystic and Malden rivers,	5,000 00
Weymouth River,	10,000 00
Town River,	8,000 00
Scituate harbor,	15,000 00
Duxbury harbor,	12,000 00
Plymouth harbor: —	
For maintenance,	10,000 00
For repairs made necessary by great storm of November, 1898,	75,000 00
Provincetown harbor,	10,000 00
Chatham harbor,	3,732 79
	$655,732 79
Appropriated by sundry civil act of March 3, 1899: —	
Boston harbor, main ship channel,	163,751 00
Total,	$819,483 79

The Secretary of War was also authorized, by the river and harbor act, of March 3, 1899, to enter into contracts for the completion of a channel 1,200 feet wide and 30 feet deep at mean low water from the main ship channel in President Roads, through Broad South Channel, at a maximum cost of $450,000.

These appropriations became available too late for active operations to be started in their expenditure during the fiscal year. No material change has been made in the several projects of improvement, and the appropriations will be expended in furtherance of these projects.

Operations have been in progress during the last fiscal year upon improvements at harbor of refuge, Sandy Bay, Cape Ann,

* Of which $5,000 could be expended on Chelsea Creek and $5,000 on Broad Sound Channel, at the discretion of the Secretary of War.

Mass., Boston harbor, Mass., removal of wrecks, examinations and surveys, and the work accomplished was as follows:—

Harbor of Refuge, Sandy Bay.

Operations were continued under a contract with the Rockport, Pigeon Hill and Cape Ann granite companies. There were 67,527 tons of stone deposited in extension of the substructure of the breakwater during the year, and the contract was completed on March 31, 1899.

Boston Harbor.

Operations were continued under the continuing contract dated Feb. 11, 1897, with Messrs. Breymann Bros. of Toledo, O., to dredge 2,910,718 cubic yards, more or less, of material from and in completion of the proposed main ship channel, 1,000 feet wide and 27 feet deep at mean low water, under the project of Aug. 11, 1892.

During the fiscal year 671,394.5 cubic yards of material were dredged from the "Narrows" in the lower main ship channel. On June 30, 1899, this section of the dredging was nearly completed, and one dredge had been transferred to the upper main ship channel.

The lower main ship channel from Boston Light to President Roads is now 27 feet deep at mean low water and 1,000 feet wide, excepting that at the "Narrows" it is obstructed by ledges uncovered by the dredging, which contract the clear width of channel to about 800 feet. The removal of these ledges will probably be commenced in the spring of 1900.

The full estimated amount of money necessary to complete the project of Aug. 11, 1892, has been appropriated by Congress, and is now available.

Wrecks.

On March 31, 1899, the wreck of schooner "J. M. Eaton" was removed from the entrance to Pigeon Cove harbor, Rockport, Mass., under a contract with F. Scripture, dated March 6, 1899.

On June 8, 1899, the wreck of a vessel, name unknown, was removed from the Weymouth Fore River, Mass., under a contract dated May 28, 1899, with Hiram W. Phillips of Quincy, Mass.

On April 25, 1899, it was reported that a wreck lying in Chatham harbor, Mass., was an obstruction to navigation, and on April 28, 1899, $250 was allotted for its removal. Bids were opened for this work on June 26, 1899, but no contract was entered into during the fiscal year.

On June 24, 1899, the wreck of the small schooner "Lydia

Jane," in Provincetown harbor, Mass., was reported an obstruction to navigation, and on June 28, 1899, $250 was allotted for its removal. Nothing further was done toward the removal of the wreck during the fiscal year ending June 30, 1899.

Examinations and Surveys.

The river and harbor act of March 3, 1899, ordered preliminary examinations or surveys to be made, and reports submitted for the following localities: Sandy Bay, Mass.; Winthrop harbor, Mass.; piers and breakwater at Rockport, Mass.; Beverly harbor, Mass.; Sandwich harbor, Mass., and Cohasset harbor, Mass. At the close of the fiscal year preliminary reports had been made upon Sandy Bay, Mass.; piers and breakwater at Rockport, Mass., and Cohasset harbor, Mass.; and surveys were recommended for Cohasset harbor and piers and breakwater at Rockport.

Very respectfully, CHAS. R. SUTER,
Colonel, Corps of Engineers.

STATEMENT OF MAJ. D. W. LOCKWOOD, CORPS OF ENGINEERS, U. S. A.

NEWPORT, R. I., Dec. 4, 1899.

Mr. WOODWARD EMERY, *Chairman, Board of Harbor and Land Commissioners, Boston, Mass.*

SIR: — In compliance with your request of November 28, I enclose you a summary of the work done by the United States during the fiscal year ending June 30, 1899, in the rivers and harbors in Massachusetts.

Respectfully, D. W. LOCKWOOD,
Major, Corps of Engineers, U. S. A.

Abstract of work of river and harbor improvement in the State of Massachusetts by the United States government, under the direction of Maj. D. W. Lockwood, Corps of Engineers, U. S. Army, for the fiscal year ending June 30, 1899: —

Hyannis Harbor.

No work was in progress during the fiscal year.

The present project for the improvement of this harbor contemplates the dredging of an area of 36 acres protected by the breakwater to a depth of 15.5 feet. Of this area, about 26.6 acres have been dredged, and two cuts, each 25 feet wide and 13 feet deep, have been dredged in to the wharf of the New York, New Haven & Hartford Railroad Company.

Nantucket Harbor.

A contract was awarded for continuing the construction of jetties at the entrance to the harbor. The contract provides for raising the submerged portions of both the east and west jetties to the half-tide level, and making slight repairs to portions of the jetties damaged by storms and ice.

Vineyard Haven Harbor.

No work was in progress during the fiscal year. The project for the protection of the bluffs on the East and West Chops has been completed.

Woods Hole Channel.

A contract was awarded for continuing the deepening and widening of the channel in the strait leading into Buzzards Bay. The project for this improvement contemplates securing a channel 300 feet wide and 13 feet deep at mean low water.

New Bedford Harbor.

Contracts were awarded for dredging in the anchorage area and in the channel leading through the new draw. There is now a channel 200 feet wide and 18 feet deep from Buzzards Bay to New Bedford, and the existing project provides for an anchorage area $\frac{1}{2}$ mile long and 600 feet wide and a channel 250 feet wide from the main channel through the new drawbridge, all having a depth of 18 feet at mean low water.

Canapitsit Channel.

No work was in progress during the fiscal year. The project for the improvement of this channel has been completed.

Taunton River.

A contract was awarded for dredging in this river in the reach just above Berkley bridge. There are still a few points at which deepening and widening are required below Berkley bridge.

Removal of Wrecks.

During the fiscal year the following wrecks were removed, so as to no longer form obstructions to navigation : —

Schooner "Asia," on Killpond Bar, Nantucket Sound, in 8 feet of water.

Barge "Excelsior," on Killpond Bar, Nantucket Sound, in 12 feet of water.

Schooner "Angola," about 1¼ miles W. N. W. of Cross Rip Light Ship in about 50 feet of water, in Vineyard Sound.

Schooner "Melinda Wood" in Hyannis harbor, in 14 feet of water.

Schooner "Fannie Flint," about 1¼ miles south by west from Pollock Rip Light Ship, in about 35 feet of water.

INSPECTIONS MADE BY THE BOARD DURING THE YEAR.

1898.

Dec. 3. Green Harbor, in Marshfield, and the beach from a point opposite Powder Point bridge nearly to the old mouth of North River, to ascertain the effects of the great storm of November, 1898.

6. Shores and beaches of Marblehead harbor, to ascertain the effects of the great storm of November, 1898. Premises of George H. Burton, in Swampscott, relative to proposed removal of material from the beach.

7–13. Docks and terminal facilities, in New York and other ports, with reference to the construction of pile platforms at the new pier and to other improvements on the Commonwealth flats at South Boston.

27. Beaches in Hull, relative to the removal of material therefrom, and to ascertain the effects of the great storm of November, 1898.

1899.

Jan. 6, 7. Terminal facilities in Boston, in company with the mayor and harbor commissioners of Montreal.

17, 20. Beach near the Black Rock House, in Cohasset, relative to laying a drain pipe in tide water.

23. Work done on channel and jetties, at Osterville, authorized by chapter 483 of the Acts of 1897 and chapter 440 of the Acts of 1898.

24. Scorton harbor and portions of Sandwich, to ascertain the effect of the great storm of November, 1898. Shore property of Mrs. Martha M. Magee, in Beverly, relative to laying drain pipe in tide water.

26, 27. Work done by the Commonwealth on the Province Lands, in Provincetown, in company with the legislative committee on harbors and public lands.

Feb. 21. Fort Point Channel, opposite Hecht's wharf, in Boston, for the purpose of locating an obstruction to navigation.

1899.

Feb. 23, 24. East Bay in Osterville, Lewis Bay in Hyannis, Witchmere harbor in Harwich, in company with the legislative committee on harbors and public lands.

28. Buildings on Boylston Street, in Boston, relative to alleged violation of restrictions in deeds from the Commonwealth.

March 6. South Bay, near Dorchester Avenue, relative to the dumping of material without authority from the Board.

8. Fort Point Channel, opposite Hecht's wharf, in Boston, to ascertain if an obstruction to navigation had been removed.

17. Tuck's Point, in Beverly, relative to alleged removal of material from the beach.

21. White Head flats, in Hull Bay, relative to the dumping of dredged material.

23, 25. Menamsha Inlet in Gay Head and Chilmark, and Lake Anthony in Cottage City, to obtain data for preparing plans and specifications of work authorized by chapters 133 and 155 of the Acts of 1899.

April 4. Shore property of Mrs. Martha M. Magee and W. S. and J. T. Spaulding, in Beverly, relative to work in tide water.

6. Outlet of Winter Pond, in Winchester, on complaint made to the Board relative to an obstruction therein.

13. Sites of proposed canal across Cape Cod, in company with the legislative committee on harbors and public lands.

24. Work done on channel and jetties at Osterville, under direction of the Board.

28. Shores and beaches in Scituate, to ascertain the effects of the great storm of November, 1898.

29. Work done under direction of the Board on jetties at Green Harbor, in Marshfield, under chapter 469 of the Acts of 1898.

May 2. Wharf on Fort Point Channel, in Boston, occupied by Marston Coal Company, relative to proposed improvements. Charles River, near the Abattoir in Brighton, relative to dredging done in vicinity of sea wall. Work done and in progress on the Commonwealth flats at South Boston.

3. Site of dumping ground for dredged material, at mouth of Coles River, in Swansea.

1899.

May 9. Banks of the Connecticut River, above and below the village of Hadley, to ascertain their condition. Protective works built by the Commonwealth on the western bank of the river, at Agawam and West Springfield. Property of White, Holman & Co., on Chelsea Creek in Chelsea, relative to proposed bulkhead and filling.

12. Beach at Hough's Neck, in Quincy, relative to the removal of material therefrom.

15. Beach between Point Allerton and Strawberry Hill, in Hull, relative to proposed removal of material.

18. Site of dumping done in South Bay without authority from the Board.

25. } Work done at Menamsha Inlet, in Gay Head and
27. } Chilmark, under direction of the Board.

29. Beach between Point Allerton and Strawberry Hill, in Hull, relative to the proposed removal of material.

June 1. } Work done on jetties at Green Harbor, in Marshfield,
2. } under the direction of the Board. Salters Beach and the Gurnet, in Plymouth, relative to the proposed removal of gravel. Site of dumping in Mystic River, near Malden bridge, in Charlestown.

7. Stony Beach, in Hull, relative to the depositing of material thereon.

9. } Work done at Menamsha Inlet, in Gay Head and
10. } Chilmark, under the direction of the Board.

12. Property of the New England Gas and Coke Company on Mystic River, in Everett, relative to displacement of tide water.

15. Shores of Lake Whalom, in Lunenburg, relative to alleged encroachments.

17. Work done on jetties at Green Harbor, in Marshfield, under the direction of the Board.

30. Beaches in Hull, relative to the removal of material therefrom.

July 5. Property of C. C. Hanley, on Town River, in Quincy, relative to proposed structure and filling.

7. }
10. } Work done on channel and jetties at Osterville, under
11. } the direction of the Board.

12. Work done on channel and jetties at Lake Anthony, in Cottage City, under chapter 441 of the Acts of 1898 and chapter 155 of the Acts of 1899.

13. Flats in the vicinity of Jeffries Point, in East Boston.

1899.

July 14. New mouth of North River, in Scituate. Tidal stream in Essex, on complaint that the same has been obstructed.

15., 24., 25. Work done on jetties at Green Harbor, in Marshfield, under the direction of the Board.

28. Work done on channel and jetties at Osterville, under the direction of the Board.

Aug. 4. Lewis Bay, in Hyannis, in connection with a survey of the same, in progress, under chapter 96 of the Resolves of 1899. Site of proposed work by the Granville Rugg estate on Merrimac River, in Haverhill.

5. Work on jetties and channel at Lake Anthony, in Cottage City, under the direction of the Board.

9., 10. Work done on channel and jetties in Osterville, under the direction of the Board. Lewis Bay, in Hyannis, in connection with a survey of the same, in progress.

11. Witchmere harbor, in Harwich, relative to work proposed to be done by the Commonwealth under chapter 463 of the Acts of 1899.

12. Work done by the Commonwealth on the Province Lands, at Provincetown.

16. Phillips Beach, in Marblehead, relative to the proposed removal of material.

16., 17. Work done on jetties at Green Harbor, in Marshfield, under the direction of the Board.

18. Constitution wharf, in Boston, relative to proposed pile structures.

19. Work done on jetties and channel at Lake Anthony, in Cottage City, under the direction of the Board.

22. Site of obstruction to navigation in Boston harbor, near the Marine Park at South Boston.

23., 24. Work done on channel and jetties in Osterville, under the direction of the Board. Lewis Bay, in Hyannis, in connection with a survey of the same, in progress.

28. Work in progress at new pier and dock and on other portions of the Commonwealth flats at South Boston.

30. Hicks bridge, in Westport, relative to proposed repairs.

Sept. 1., 2. Work done at Lake Anthony in Cottage City, and at Menamsha Inlet in Gay Head and Chilmark, under the direction of the Board. Swan Neck Island, in Edgartown. Harbor at Cuttyhunk.

1899.

Sept. 7. Work done on jetties at Green Harbor, in Marshfield, under the direction of the Board.

8. South bank of Charles River, at a point one and one-half miles below the Abattoir in Brighton, to verify a report that a coffer-dam, built during the laying of a pipe from the shore into the river, had been removed.

8. } Work done on channel and jetties in Osterville, under
9. } the direction of the Board. Lewis Bay, in Hyannis, in connection with a survey of the same, in progress.

11. Site of proposed bridge across Acushnet River, in Acushnet.

15. } Work done on jetties at Green Harbor, in Marshfield,
16. } under the direction of the Board.

18. Work done and in progress on the Commonwealth flats at South Boston.

22. Wharf of the American Soda Fountain Company on Fort Point Channel, in Boston, relative to the dumping of refuse material.

23. Work done on jetties at Lake Anthony, in Cottage City, under the direction of the Board. Highway and bridge bordering on Assowompsett Pond, in Lakeville, relative to proposed encroachment.

26. Work done on jetties at Green Harbor, in Marshfield, under the direction of the Board.

28. Beach at Hough's Neck, in Quincy, relative to the proposed removal of material.

29. } Work done on channel and jetties in Osterville. New
30. } outlet of Scorton River, in Sandwich.

Oct. 6. Dock on South River, in Salem, relative to proposed filling.

17. Property on Boylston Street, in Boston, relative to alleged violation of restrictions in deeds from the Commonwealth.

19. New Bedford and Fairhaven bridge, in company with the Railroad Commissioners.

20. Work done on channel and jetties at Lake Anthony, in Cottage City, under the direction of the Board. Site of proposed wharf of Alfred C. Harrison, in Woods Hole Little harbor.

Nov. 2. Work done on jetties at Witchmere harbor, in Harwich, under chapter 463 of the Acts of 1899.

1899.

Nov. 3. Waquoit Bay, and ponds in Falmouth, relative to desired improvements. Wharf of the New York and Boston Dyewood Company, in East Boston, relative to proposed extension.

7. Work done at Menamsha Inlet, in Gay Head and Chilmark, under the direction of the Board.

8. Site of proposed filling, by Henry W. Smith and others, in Chelsea Creek, Chelsea. Wharves and docks of George F. Welch, in Scituate, relative to proposed filling.

9. Work done on channel and jetties at Lake Anthony, in Cottage City, under the direction of the Board. Site of proposed wharf and dredging on Squam River, in Gloucester. Wharf property of Rockport Granite Company, in Folly Cove, Gloucester.

13. Site of dumping being done near Weeks' wharf, at East Boston.

16. Site of proposed work at wharf of Read Bros., on Taunton River, in Fall River.

17. 21. 22. Dumping at sea of material dredged from channels of Boston harbor.

25. Work done on jetties at Witchmere harbor, in Harwich; work done on channel and jetties at Osterville, under the direction of the Board.

Licenses granted during the Year.

Nos.

2200. Petition of the city of Boston for license to build a temporary pile platform annexed to Warren bridge on Charles River in the city of Boston. Granted Dec. 6, 1898.

2201. Petition of the city of Boston for license to build a pile platform in a dock on Roxbury Canal in the city of Boston. Granted Dec. 7, 1898.

2202. Petition of Montgomery & Howard for license to construct a launching-way, on piles, on Chelsea Creek in the city of Chelsea. Granted Dec. 7, 1898.

2203. Petition of the Garfield and Proctor Coal Company for license to widen its wharf, on piles, on Acushnet River in the city of New Bedford. Granted Dec. 7, 1898.

2204. Petition of George L. Damon for license to build and maintain a bulkhead, pile platform and solid filling, on Charles River in the city of Cambridge. Granted Dec. 14, 1898.

Nos.

2205. Petition of the Boston Electric Light Company for approval of plans for building fender-guards at Congress Street bridge, in connection with the laying of wires across Fort Point Channel in the city of Boston, under authority of chapter 249 of the Acts of 1898. Granted Dec. 19, 1898.

2206. Petition of William B. Stearns for license to build and maintain a marine railway and dolphins in Marblehead harbor in the town of Marblehead. Granted Dec. 22, 1898.

2207. Petition of the New England Gas and Coke Company for license to build a pile platform and dolphins on Island End River and Mystic River in the city of Everett. Granted Dec. 28, 1898.

2208. Petition of Harry E. Converse for license to maintain a wharf as now built and to extend the same in Buzzards Bay at Charles Neck in the town of Marion. Granted Jan. 18, 1899.

2209. Petition of Elsie M. Hollingsworth for license to build and maintain a pile pier in Vineyard Haven harbor in the town of Tisbury. Granted Jan. 18, 1899.

2210. Petition of John Smith and John L. Mitchell for license to maintain a pile wharf as now built, and to construct a dolphin, in Hull Bay in the town of Hull. Granted Feb. 1, 1899.

2211. Petition of Sylvia B. Knowlton for license to build and maintain a solid-filled wharf in Marion harbor in the town of Marion. Granted Feb. 1, 1899.

2212. Petition of Margaret F. Carroll for license to build and maintain a boat landing in Great Herring Pond in the town of Plymouth. Granted Feb. 1, 1899.

2213. Petition of George N. Swallow for license to lay and maintain a drain pipe in Massachusetts Bay in the town of Cohasset. Granted Feb. 3, 1899.

2214. Petition of the Turners Falls Lumber Company for license to hang and maintain booms in Connecticut River in the towns of Gill and Montague. Granted Feb. 3, 1899.

2215. Petition of the Metropolitan Water Board for approval of plans for driving piles, constructing a fender-guard and laying water pipe in and across Saugus River, northwesterly of Fox bridge, in the city of Lynn and town of Saugus, as authorized by chapter 488 of the Acts of 1895. Granted Feb. 16, 1899.

Nos.

2216. Petition of William K. Niver & Co. for license to rebuild their wharf on Fort Point Channel in the city of Boston. Granted Feb. 16, 1899.

2217. Petition of the Old Colony Railroad Company for license to widen its bridge, extend abutment and fill solid, in South Bay in the city of Boston. Granted Feb. 16, 1899.

2218. Petition of the Lynn & Boston Railroad Company for approval of plans for constructing a pile bridge across Saugus River, north-westerly of Fox bridge, in the city of Lynn and town of Saugus, as authorized by chapter 202 of the Acts of 1859. Granted Feb. 17, 1899.

2219. Petition of the Fiske Wharf and Warehouse Company for license to widen its north pier, on piles, in Boston harbor in the city of Boston. Granted March 7, 1899.

2220. Petition of David W. Low and Charles H. Porter for license to build and maintain a pile and timber boat landing and float stage on Little River in the city of Gloucester. Granted March 7, 1899.

2221. Petition of the Lynn & Boston Railroad Company for approval of plans for constructing a steel bridge across a creek in the town of Revere flowing between Pines River and the upland, as authorized by chapter 202 of the Acts of 1859. Granted March 16, 1899.

2222. Petition of the Lynn & Boston Railroad Company for approval of plans for constructing a pile bridge across Pines River in the towns of Revere and Saugus, as authorized by chapter 202 of the Acts of 1859. Granted March 16, 1899.

2223. Petition of the Lynn & Boston Railroad Company for approval of plans for constructing a steel bridge across a creek in the town of Saugus flowing between Pines River and Saugus River, as authorized by chapter 202 of the Acts of 1859. Granted March 16, 1899.

2224. Petition of William H. Herbolt for license to build a bulkhead and fill solid in Provincetown harbor in the town of Provincetown. Granted March 17, 1899.

2225. Petition of the Board of Park Commissioners of Worcester for license to build and maintain a boat landing in Lake Quinsigamond at Lake Park in the town of Shrewsbury. Granted March 17, 1899.

Nos.

2226. Petition of the Metropolitan Water Board for approval of plans for laying a water pipe across Mystic River in the city of Medford and town of Arlington, northerly of the bridge across said river at High Street, as authorized by chapter 488 of the Acts of 1895. Granted March 21, 1899.

2227. Petition of the New England Telephone and Telegraph Company of Massachusetts for approval of plans for laying a submarine conduit for cables and wires under and across the draw-ways in Congress Street bridge on Fort Point Channel in the city of Boston, under authority of chapter 249 of the Acts of 1898. Granted March 28, 1899.

2228. Petition of the Boston Electric Light Company for approval of plans for driving piles and laying a conduit for electric wires across Fort Point Channel at Dover Street bridge in the city of Boston, under authority of chapter 249 of the Acts of 1898. Granted March 28, 1899.

2229. Petition of the Nantasket Beach Steamboat Company for license to build an extension to Nantasket Pier, on piles, and to construct and maintain dolphins in Weir River in the town of Hull. Granted March 30, 1899.

2230. Petition of Edward W. Chadwick for license to build and maintain a pile pier in Edgartown harbor at Chappaquiddick in the town of Edgartown. Granted April 6, 1899.

2231. Petition of the Plymouth Cordage Company for license to build sea walls, fill solid and construct two wooden box sewers, in Plymouth harbor in the town of Plymouth. Granted April 11, 1899.

2231 A. Petition of the National Dock and Warehouse Company for license to build a sea wall and pile platform, and fill solid a portion of its dock, in Boston harbor at East Boston. Granted April 12, 1899.

2232. Petition of Martha M. Magee for license to lay and maintain a drain pipe in Beverly harbor in the city of Beverly. Granted April 14, 1899.

2233. Petition of Walter M. Lowney and others, trustees, for license to rebuild and extend their wharf, partly solid and partly on piles, in Boston harbor, adjoining Atlantic Avenue in the city of Boston. Granted April 20, 1899.

Nos.

2234. Petition of the Massachusetts Pipe Line Gas Company for approval of plans for laying a pipe under Mystic River, easterly of and near Malden bridge in the city of Boston, as authorized by chapter 537 of the Acts of 1896. Granted April 20, 1899.

2235. Petition of the Boston & Albany Railroad Company for license to rebuild the head of its Dock No. 8, Grand Junction wharves, in Boston harbor at East Boston, by building a sea wall and pile platform or wharf, and excavating in said dock. Granted May 2, 1899.

2236. Petition of Ira B. Cushing for license to build and maintain a pile pier and float stage in Red Brook harbor in the town of Bourne. Granted May 2, 1899.

2237. Petition of the Board of Metropolitan Sewerage Commissioners for approval of plans for placing stone riprap over a portion of the sewer in Shirley Gut between Point Shirley and Deer Island, under authority of chapter 439 of the Acts of 1889. Granted May 4, 1899.

2238. Petition of George A. Gardner and George P. Gardner for license to build and maintain a wharf and float stage in Buzzards Bay at Monument Beach in the town of Bourne. Granted May 5, 1899.

2239. Petition of the Curtis and Pope Lumber Company for license to extend its wharf, on piles, on Roxbury Canal in the city of Boston. Granted May 8, 1899.

2240. Petition of John Pridgeon, Jr., for license to extend his wharf, on piles, in Vineyard Haven harbor in the town of Cottage City. Granted May 8, 1899.

2241. Petition of Orlando E. Lewis for license to fill flats in Crystal Cove southerly of Washington Avenue in the town of Winthrop. Granted May 8, 1899.

2242. Petition of the Boston Transit Commission for approval of plans for constructing a draw foundation, draw-fender piers and fender-guards for Charlestown bridge on Charles River in the city of Boston, as authorized by chapter 548 of the Acts of 1894. Granted May 12, 1899.

2243. Petition of the Marston Coal Company for license to widen its wharf, on piles, on Fort Point Channel in the city of Boston. Granted May 16, 1899.

2244. Petition of William E. Gutterson for license to widen his wharf, on piles, on Fort Point Channel in the city of Boston. Granted May 16, 1899.

Nos.

2245. Petition of Francis W. Parsons and William V. Kellen for license to build and maintain dikes in Dam Pond, Middle Pond and Isham Pond, flowing into North Bay, and to excavate a canal, at Osterville in the town of Barnstable. Granted May 31, 1899.

2246. Petition of Henry Bigelow Williams for license to build and maintain a pile pier in Nantucket harbor near Brant Point in the town of Nantucket. Granted May 31, 1899.

2247. Petition of Sol Smith Russell for license to build and maintain a pile pier and boat house in Edgartown harbor in the town of Edgartown. Granted May 31, 1899.

2248. Petition of the Boston Elevated Railway Company for license to rebuild a portion of Lincoln wharf in Boston harbor in the city of Boston. Granted June 16, 1899.

2249. Petition of the Mosquito Fleet Yacht Club for license to build and maintain a pile pier and float stage in Old Harbor at South Boston. Granted June 16, 1899.

2250. Petition of the New England Gas and Coke Company for license to build a pile wharf and bulkhead, fill solid, excavate and dredge, in Island End River in the city of Everett. Granted June 19, 1899.

2251. Petition of the Edison Electric Illuminating Company of Boston for license to build sea walls and fill solid in Fort Point Channel in the city of Boston. Granted June 19, 1899.

2252. Petition of Dexter H. Craig for license to extend his wharf, partly solid and partly on piles, and to dredge, in Plymouth harbor in the town of Plymouth. Granted June 26, 1899.

2253. Petition of the city of Boston for license to build a pile wharf in Boston harbor at Long Island. Granted June 27, 1899.

2254. Petition of May A. Coleman for license to build and maintain a pile pier in Nantucket harbor in the town of Nantucket. Granted June 27, 1899.

2255. Petition of Harry E. Weston for license to build and maintain a boat house, on piles, in Lake Whalom in the town of Lunenburg. Granted June 27, 1899.

2256. Petition of Emma Rosson for license to build and maintain a portion of a boat house, on piles, and a float stage, in Lake Quannapowitt in the town of Wakefield. Granted June 27, 1899.

Nos.

2257. Petition of John S. Shannon for license to maintain a boat landing, on piles, and a float stage, in Lake Whalom in the town of Lunenburg. Granted June 27, 1899.

2258. Petition of the city of Boston for approval of plans for constructing a pile bridge across Mystic River at the site of Malden bridge, as authorized and required by chapter 280 of the Acts of 1899. Granted July 7, 1899.

2259. Petition of the Massachusetts Pipe Line Gas Company for approval of plans for constructing a tunnel, laying a pipe and sinking two shafts in and under Charles River at the draw ways in Charlestown bridge; also for driving piles, constructing pile platforms and placing riprap, under authority of chapter 537 of the Acts of 1896. Granted July 7, 1899.

2260. Petition of John Morrison for license to extend and rebuild a portion of Maverick wharf in Boston harbor at East Boston. Granted July 7, 1899.

2261. Petition of Caroline A. Breed and Henry B. Sprague for license to build a bulkhead, fill solid, drive piles and construct dolphins in Lynn harbor in the city of Lynn. Granted July 7, 1899.

2262. Petition of the city of Cambridge, by its board of park commissioners, for license to change the present shore line of Charles River between Brookline Street and River Street, in the city of Cambridge, by constructing a sea wall and by excavating and filling. Granted July 19, 1899.

2263. Petition of the city of Cambridge, by its board of park commissioners, for license to change the present northeasterly shore line of Charles River from a point near Boylston Street bridge to a point above the Cambridge Hospital grounds, in the city of Cambridge, by constructing sea walls and bulkheads and by excavating and filling. Granted July 19, 1899.

2264. Petition of the Board of Metropolitan Park Commissioners for license to change the present south-westerly shore line of Charles River from a point near Boylston Street to a point opposite the Cambridge Hospital grounds, in the city of Boston, by excavating and filling. Granted July 19, 1899.

2265. Petition of the Crescent Boat Club for license to build a boat house, on piles, on Charles River westerly of Essex Street bridge in the city of Boston. Granted Aug. 1, 1899.

Nos.

2266. Petition of the Massachusetts Pipe Line Gas Company for approval of plans for constructing a tunnel and laying a pipe under and across Charles River southerly of and near Cambridge Street bridge in the cities of Boston and Cambridge, as authorized by chapter 537 of the Acts of 1896. Granted Aug. 1, 1899.

2267. Petition of the city of Boston for license to widen the present draw way in Chelsea bridge, north, on Mystic River in the cities of Boston and Chelsea, and to build a temporary pile bridge on the up-stream side of said bridge. Granted Aug. 1, 1899.

2268. Petition of Henry R. Reed for license to build and maintain a stone and timber pier and float stage in Marion harbor in the town of Marion. Granted Aug. 1, 1899.

2269. Petition of the United States, by Col. Charles R. Suter, for license to build a pile wharf in Boston harbor at Lovell's Island. Granted Aug. 2, 1899.

2270. Petition of the city of Boston for approval of plans for constructing a steel bridge over Fort Point Channel in the extension of Atlantic Avenue (formerly Cove Street) westerly of Federal Street bridge, in the city of Boston, as authorized and required by chapter 466 of the Acts of 1899. Granted Aug. 2, 1899.

2271. Petition of C. C. Hanley for license to build bulkheads and pile platform, to fill solid and dredge, in Town River, in the city of Quincy. Granted Aug. 9, 1899.

2272. Petition of Henry J. Brennan for license to build and maintain piers and a float stage in Lake Whalom in the town of Lunenburg. Granted Sept. 12, 1899.

2273. Petition of J. W. Goodnow for license to build and maintain a pile wharf on Vineyard Sound at Falmouth Heights in the town of Falmouth. Granted Sept. 12, 1899.

2274. Petition of the Gardner Electric Light Company for license to build a retaining wall and fill solid in Crystal Lake in the town of Gardner. Granted Sept. 12, 1899.

2275. Petition of Harvard University for license to drive piles and construct approaches and platforms for a boat house on Charles River, northerly of North Harvard Street bridge in the city of Boston. Granted Sept. 12, 1899.

2276. Petition of the Lynn Gas and Electric Company for license to build a sea wall and bulkhead and fill solid in Lynn harbor in the city of Lynn. Granted Sept. 14 ,1899.

Nos.

2277. Petition of Nathaniel E. Harlow for license to build a bulkhead and fill solid in Plymouth harbor in the town of Plymouth. Granted Sept. 14, 1899.

2278. Petition of the North Packing and Provision Company for license to widen its wharf, on piles, on Millers River in the city of Somerville. Granted Sept. 14, 1899.

2279. Petition of Fred J. Gifford and J. C. McCarthy for license to build a sea wall and fill solid in Palmers Cove in the city of Salem. Granted Sept. 14, 1899.

2280. Petition of the Plymouth Cordage Company for license to build a sea wall and sewer, and to fill solid, in Plymouth harbor in the town of Plymouth. Granted Sept. 14, 1899.

2281. Petition of Charles H. Boynton for license to extend his wharf, on piles, in Gloucester harbor in the city of Gloucester. Granted Sept. 14, 1899.

2282. Petition of the Merchants and Miners Transportation Company for license to build pile structures at the head of the dock between Constitution wharf and Battery wharf in the city of Boston. Granted Sept. 18, 1899.

2283. Petition of Alfred C. Harrison for license to build and maintain a stone and pile pier in Woods Hole Little harbor in the town of Falmouth. Granted Sept. 19, 1899.

2284. Petition of John A. Jeremiah for license to build and maintain a pile pier, boat ways and float stage in Edgartown harbor at Chippaquiddick Island in the town of Edgartown. Granted Sept. 19, 1899.

2285. Petition of the Boston Transit Commission for license to build a pile wharf on Charles River, on the westerly side of the Charlestown approach to the Charlestown bridge in the city of Boston. Granted Sept. 19, 1899.

2286. Petition of the city of Malden, by its board of street commissioners, for license to fill solid and build a culvert in Malden River, and to excavate and change the course of a portion of said river in the city of Malden. Granted Sept. 21, 1899.

2287. Petition of the Thomson-Houston Electric Company for license to construct two dolphins in Saugus River in the city of Lynn. Granted Sept. 21, 1899.

2288. Petition of the Merchants and Miners Transportation Company for license to build a pile structure at the head of the north dock of Constitution wharf in the city of Boston. Granted Sept. 21, 1899.

Nos.

2289. Petition of the city of Boston for license to build a crib and inlet box in Boston harbor on the easterly side of Long Island. Granted Sept. 21, 1899.

2290. Petition of the estate of J. P. Monks for license to build a bulkhead and pile wharf, fill solid and dredge, in Boston harbor near the Reserved Channel at South Boston. Granted Sept. 27, 1899.

2291. Petition of the city of Boston for license to build a sea wall or bulkhead and fill solid in Mystic River adjoining the north-westerly side of Alford Street in the city of Boston. Granted Sept. 28, 1899.

2292. Petition of the Massachusetts Pipe Line Gas Company for approval of plans for driving piles in Mystic River adjoining Alford Street in the city of Boston, as authorized by chapter 537 of the Acts of 1896. Granted Sept. 28, 1899.

2293. Petition of the city of Boston for approval of plans for constructing a temporary pile bridge across Mystic River near Malden bridge in the city of Boston, under authority of chapter 280 of the Acts of 1899. Granted Oct. 3, 1899.

2294. Petition of the town of Westport, by its highway surveyor, for license to repair the highway, including the bridge known as Hicks bridge, in and over the east branch of Westport River in the town of Westport. Granted Oct. 3, 1899.

2295. Petition of the Garfield and Proctor Coal Company for license to drive piles, build a sea wall and fill solid, in Acushnet River in the city of New Bedford. Granted Oct. 5, 1899.

2296. Petition of the West End Street Railway Company for license to build bulkheads and fill solid in Mystic River in the cities of Boston and Somerville. Granted Oct. 6, 1899.

2297. Petition of the city of Medford for license to build a head wall at the mouth of Gravelly Creek on Mystic River in the city of Medford. Granted Oct. 12, 1899.

2298. Petition of the West End Street Railway Company for license to build bulkheads and fill solid in Chelsea Creek at East Boston. Granted Oct. 16, 1899.

2299. Petition of Charles A. Campbell for license to build pile wharves and to dredge in Mystic River in the city of Chelsea. Granted Oct. 16, 1899.

Nos.

2300. Petition of the Boston, Revere Beach & Lynn Railroad Company for license to fill solid in Boston harbor southerly of Washington Avenue in the town of Winthrop. Granted Oct. 26, 1899.

2301. Petition of Orlando E. Lewis for license to fill flats in Crystal Cove southerly of Washington Avenue in the town of Winthrop. Granted Oct. 26, 1899.

2302. Petition of the Union Freight Railroad Company for license to dump snow and ice into Charles River, in the city of Boston. Granted Nov. 6, 1899.

2303. Petition of the Boston Elevated Railway Company for license to dump snow and ice into tide waters. Granted Nov. 6, 1899.

2304. Petition of John Rood and the firm of Almy, Bigelow & Washburn, for license to build a sea wall and fill a dock on South River in the city of Salem. Granted Nov. 6, 1899.

2305. Petition of the New York & Boston Dyewood Company for license to extend its wharf, on piles, in Boston harbor at East Boston. Granted Nov. 6, 1899.

2306. Petition of the county commissioners of Plymouth County for license to widen a highway and bridge in and over Assowompsett Pond in the town of Lakeville. Granted Nov. 6, 1899.

2307. Petition of Alfred C. Harrison for license to build and maintain a stone and pile pier in Woods Hole Little harbor in the town of Falmouth. Granted Nov. 8, 1899.

2308. Petition of the city of Boston, by the superintendent of streets, for license to dump snow and ice into tide waters. Granted Nov. 9, 1899.

2309. Petition of the Massachusetts Pipe Line Gas Company for approval of plans for laying a pipe in and under Charles River at the draw way in Cambridge Street bridge in the cities of Boston and Cambridge. Granted Nov. 14, 1899.

2310. Petition of the Lewis Wharf Company for license to drive piles in the dock adjoining the southerly side of Lewis wharf, also within the present lines of said wharf, in the city of Boston. Granted Nov. 14, 1899.

2311. Petition of George F. Welch for license to build bulkheads and fill solid in two docks in Scituate harbor in the town of Scituate. Granted Nov. 14, 1899.

Nos.

2312. Petition of the Sturtevant Wharf and Storage Company for license to extend its wharf, on piles, in Boston harbor at East Boston. Granted Nov. 17, 1899.

2313. Petition of Andrew A. Meyer for license to build and maintain a pile pier and dredge a channel in Quincy Bay at Hough's Neck in the city of Quincy. Granted Nov. 17, 1899.

2314. Petition of Everett Joy for license to build and maintain a pile pier in Lake Anthony in the town of Cottage City. Granted Nov. 23, 1899.

MISCELLANEOUS PERMITS GRANTED DURING THE YEAR.

CHARLES S. GOODING, to remove gravel and sand from a portion of the beach at Kenberma in Hull. Granted Dec. 30, 1898.

BENJAMIN P. WARE, to remove material from his beach at Clifton in Marblehead. Granted Dec. 30, 1898.

BATCHELDER BROTHERS, to dump snow from Federal Street bridge into tide water in the city of Boston. Granted Jan. 4, 1899.

FRANK C. HYDE, to remove gravel and sand from a portion of the beach at Kenberma in Hull. Granted Jan. 5, 1899.

EMMA E. HOBART, to remove gravel and sand from a portion of the beach at Kenberma in Hull. Granted Jan. 5, 1899.

F. W. JOHNSON, to remove material from the beach in front of his upland at Clifton in the town of Marblehead. Granted Jan. 18, 1899.

BAY STATE DREDGING COMPANY, to dredge not exceeding 75,000 cubic yards of material in Shirley Gut, Boston harbor. Granted Jan. 27, 1899.

CITY OF BOSTON, to lay water pipe in Bullock Street on the South Boston flats. Granted Jan. 31, 1899.

ABBOTT W. LAURENCE, to dump snow from Dover Street bridge into tide water in the city of Boston. Granted Feb. 21, 1899.

JOHN H. LANGMAID and FRANK A. LANGMAID, to remove gravel and sand from the beach in front of their upland in Marblehead. Granted March 7, 1899.

JOSEPH A. BOWEN, to dump material dredged in Fall River harbor on flats north-west of Mattapoisett Rock in Coles River, Swansea. Granted March 9, 1899.

New York, New Haven & Hartford Railroad Company, to lay and maintain, temporarily, tracks across certain lots on the South Boston flats, for the purpose of transporting filling for streets. Granted April 11, 1899.

Andrew A. Meyer, to remove gravel from the beach in front of his upland at Hough's Neck in Quincy. Granted May 12, 1899.

William H. Alles, to remove gravel and sand from the beach in front of his land at Point Allerton in Hull. Granted May 17, 1899.

George E. Parker, to remove gravel and sand from the beach in front of his upland at Clifton in Marblehead. Granted May 17, 1899.

Julian B. Hart and others, to remove gravel and sand from the beach in front of their land at Point Allerton in Hull. Granted June 1, 1899.

Joseph L. Boardman, to remove gravel from a portion of Salter's Beach in Plymouth. Granted June 5, 1899.

New England Gas and Coke Company, to dredge in Mystic River below the mouth of Island End River. Granted June 8, 1899.

S. Isaacs, to remove gravel from the beach at Wind Mill Point in Hull. Granted June 8, 1899.

Ellen F. Blodgett, to remove shale or gravel from the beach in front of her house on Beach Avenue at Kenberma in Hull. Granted June 8, 1899.

A. J. Wellington, to remove shale or gravel from the beach in front of his land at Kenberma in Hull. Granted June 8, 1899.

Selectmen of the Town of Hull, to remove gravel from the beach in Hull Bay, opposite Bay Avenue, between K and Q streets, in Hull. Granted June 12, 1899.

Col. Charles R. Suter, to remove gravel from the beach bordering on Hull Bay between Strawberry Hill and White Head in Hull, for use by the United States government. Granted June 22, 1899.

Cambridge Bridge Commission, to dredge in Charles River southerly of and near West Boston bridge. Granted July 7, 1899.

Selectmen of the Town of Hull, extending the time limit named in a permit for the removal of gravel from a beach in Hull, dated June 12, 1899. Granted July 7, 1899.

Charles Howard Smith, to remove gravel from the beach in Hull Bay, lying midway between the crossing of the New York, New Haven & Hartford Railroad at Point Allerton and Windermere station; also from the easterly bar of Hog Island in Hull Bay. Granted July 31, 1899.

Alonzo E. Smith, to dump the material dredged in Powow River under contract with the United States government on the low lands above mean high-water mark, on either bank of said river. Granted Aug. 8, 1899.

William B. Buckminster, to remove stone and other material from the beach in front of his upland at Clifton in the town of Marblehead. Granted Aug. 17, 1899.

Boston Asylum and Farm School for Indigent Boys, to remove gravel from a bar at Thompson's Island in Boston harbor. Granted Aug. 18, 1899.

Thomas F. Kelly, to use a portion of the South Boston flats for storage purposes. Granted Sept. 14, 1899.

Proprietors of the New Mattakesett Creeks, to dredge a channel in Katama Bay, Edgartown harbor, and to deposit the dredged material. Granted Sept. 18, 1899.

Andrew A. Meyer, to remove gravel from the beach in front of his upland at Hough's Neck in Quincy. Granted Oct. 6, 1899.

Walter S. Osborn, to dredge on the northerly side of the pile portion of Osborn's wharf in Edgartown harbor, and to deposit the dredged material. Granted Oct. 12, 1899.

South Boston Gas Light Company, to lay a gas main in B Street on the South Boston flats. Granted Oct. 24, 1899.

Howard W. Spurr and Others, to dredge a channel in Edgartown harbor in front of their land bounding on said harbor and to deposit the dredged material. Granted Oct. 26, 1899.

Bay State Dredging Company, to dump material dredged in Duxbury harbor, under contract with the United States government, on a portion of the beach on the easterly side of said harbor. Granted Oct. 27, 1899.

Joseph E. White, to dump material dredged in Weymouth Fore River, under contract with the United States government, on flats in Rock Island Cove in Quincy. Granted Nov. 17, 1899.

Hartford Dredging Company, to dump material dredged in Plymouth harbor, under contract with the United States government, easterly of and adjoining Long Beach in Plymouth. Granted Nov. 17, 1899.

Harbor Compensation Fund.

There was paid into the treasury of the Commonwealth during the year, under sections 14 and 16 of chapter 19, Public Statutes, and chapter 146, Acts of 1897, in payment for tide water displaced by work done under licenses granted by the Board, and for rights and privileges granted in tide waters and great ponds, the sum of $4,607.94, which was credited to the harbor compensation fund for Boston harbor. The amount in this fund on Nov. 30, 1899, was $258,297.63; the income from this fund on the same date was $23,109.55.

Commonwealth's Flats Improvement Fund.

The balance in the Commonwealth's flats improvement fund on the first day of December, 1898, was $109,656.27. To this has been added during the year $11,009.91 from the income of the fund and $442,830.90 from sales and rents of lands and from other sources, making a total of $563,497.08. Of this sum, there has been expended during the year $48,-227.94, leaving an available balance on Nov. 30, 1899, of $515.269.14.

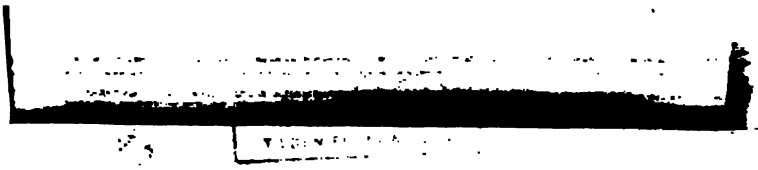
Salaries of Commissioners.

The attention of the Legislature is again invited to the inadequate compensation of the Board, in the belief that the increased work and responsibility of the commission will receive due consideration.

The foregoing report is respectfully submitted.

WOODWARD EMERY,
CLINTON WHITE,
CHARLES C. DOTEN,
Commissioners.

Dec. 1, 1899.



APPENDIX.

APPENDIX.

[A.]

[See page 7 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT, MADE THIS SIXTH DAY OF MARCH IN THE YEAR EIGHTEEN HUNDRED AND NINETY-NINE, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND GEORGE A. CAHILL OF BOSTON IN SAID COMMONWEALTH, HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The Contractor hereby covenants and agrees with the Commonwealth to provide all the labor and materials and to do and complete all the work necessary and proper in building an oak pile platform on the two sides and outer end of the solid portion of the new pier or wharf which is now being built by the Commonwealth on the South Boston Flats in Boston Harbor, all the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein shall mean the Engineer of the Board of Harbor and Land Commissioners, acting directly or through his properly authorized agents, when within the scope of the particular duties intrusted to them.

SPECIFICATIONS.

The Contractor is to furnish all the plant, tools, appliances, labor and materials necessary to build the pile platform and put it in condition for use, as follows: —

The platform is to be located on the two sides and outer end of the solid portion of the pier or wharf which the Commonwealth is now building on the South Boston Flats east of Pier No. 4 of the New England Railroad Company.

The solid portion of the wharf is 1,150 feet long and 300 feet wide, and the pile platform is to form a continuous belt or apron 50 feet wide contiguous to its two sides and outer end.

The platform is to be built of oak piles, with rough oak braces and hard pine timber.

A series of six plans on file in the office of the Board of Harbor and Land Commissioners marked "Platform for New Pier, South Boston Flats, January, 1899," and signed by Frank W. Hodgdon, Engineer, show the location, size and method of construction of the platform, and are referred to and made a part of these specifications, and are to be referred to for all details not specifically mentioned herein.

Piles and Pile-work.

All piles are to be new white or red oak sticks, with the bark on, sound, straight, and free from large knots or other imperfections which would materially affect the strength of the timber; not less than 50 per cent. of the piles to be white oak. They are to be not less than 14 inches in diameter five feet from the butt, and not less than 7 inches in diameter at the point, when ready for driving, including the bark in both cases. They are to be of the lengths shown on the plan and are to be carefully driven to such depths as the Engineer may prescribe, in order that they can be capped at the required grade without unnecessary waste of the butt.

No knotty, rotten, worm-eaten, split, peeled or partly peeled, or loose-bark piles will be accepted.

All piles must be carefully and thoroughly driven to the satisfaction of the Engineer; and any pile which may be driven in a wrong position or which may not be long enough for capping after being driven or which may be split in driving, shall be drawn up and out and another substituted.

All spurshores are to be fitted in a workmanlike manner and bolted to the main piles with two 1¼-inch screw bolts for each spurshore.

The fender piles are to be bolted to the main piles with 1¼-inch screw bolts with counter-sunk heads, one bolt in each fender pile.

Each bent of piles is to be stiffened by girders and braces of rough oak, as shown on the plan.

The girders are to be hewn or sawed on one side, and are to be large enough to square at least 4 inches by 5 inches at the small end, and are to be fastened to the piles by one 1-inch screw bolt in each bearing.

At the two outer corners the face of the platform is to be

rounded, and to have the fender piles of white oak, large and well-shaped, driven close together and bolted to the framing of the platform by two 1¼-inch screw bolts in each pile, the heads of the bolts to be counter-sunk to the depth of 5 inches, wherever required to give full bearing between the piles; white oak chocks are to be fitted and securely fastened in place. The whole platform at the corners is to be heavily braced, as shown on the plans, special care being taken to have the work done thoroughly by competent workmen.

All piles from south of the fortieth degree of North latitude must be cut between the first day of September and the first day of March of the following year. North of that line they may be cut one month later.

Floor.

The main piles are to be capped with 6-inch by 12-inch double girder caps, bolted to the piles with 1-inch screw bolts, two bolts in each pile, with two additional bolts in each butt joint. The girder caps to be covered by a 7-inch by 14-inch rider cap, fastened to the girder cap by ⅞-inch spike bolts 13 inches long, one every 4 feet.

The floor is to consist of stringers spaced two feet on centers and breaking joints throughout, each stringer to extend over at least two bays, and all butts must come on the rider caps. The stringers next to the fender caps to be 8-inches by 14-inches, and all others 6-inches by 14-inches.

The stringers are to be covered by 3-inch plank laid heart side up planed on one side to even thickness and spiked to the stringers with 7-inch steel wire nails, two nails in each end and one in each other bearing. No plank is to be less than 8 inches wide, and all are to be laid with open joints ⅜-inch wide.

The fender piles are to be capped by a solid 12-inch by 14-inch stick on edge with scarfed joints 2 feet long, each scarf bolted with four ¾-inch screw bolts.

Wherever the shoulder on any pile projects beyond the edge of the cap, it shall be bevelled off in a neat manner.

Quality of Lumber.

All lumber except the piles and rough oak braces is to be long leaf yellow pine of the quality known as "Prime," and defined in the rules regulating the classification and inspection of yellow pine lumber as adopted by the Southern Lumber and Timber Association in 1883. The oak braces are to be sound, straight and free from large knots.

PRESERVATION.

When the heads of the piles have been prepared to receive the caps and before the caps are put on, they are to be thoroughly covered with a coat of the dead oil of coal tar, containing not less than 40 per cent. of naphthaline, applied at a temperature of not less than 120° Fahrenheit, or with such similar preparation as may be approved by the Engineer.

BOLTS.

All bolts are to be of the best double refined iron. They are to have upset button or counter-sunk heads as required, of a diameter not less than $1\frac{3}{4}$ times the diameter of the bolt. Wrought iron plate-washers $3\frac{1}{2}$ inches square for $1\frac{1}{4}$-inch bolts and 3 inches square for 1-inch bolts, and all $\frac{3}{8}$-inch thick are to be used under the nuts and heads of all screw bolts, except that under the heads of those through fender piles, there are to be ring washers of $\frac{5}{8}$-inch round iron with ends firmly welded together.

BELAY POSTS.

There are to be 4 large and 27 smaller cast-iron belay posts, the large ones to be located on the two outer corners of the platform where shown on the plan; the smaller ones to be located along the sides and ends of the pier at such places as shall be designated from time to time by the Engineer. The posts are to be of the size and dimensions shown on the detail plans of the same. They are to be made of tough gray cast-iron of the best quality, the castings to be free from blow-holes, cinder patches or cold-shuts, and are to be finished in a workmanlike manner, with the surfaces smooth and full and free from sand. The thickness of metal throughout to be as shown on the plans, and if required by the Engineer, holes shall be drilled at such places in the casting as he may direct to determine the thickness of the metal. If found to be as specified, the holes to be tapped and properly plugged.

The posts at the corners of the platform are to stand on the foundations prepared for them, as shown on the detailed plans. The smaller posts to stand on a special foundation prepared for each one, consisting of two 12-inch by 14-inch stringers on edge, laid upon the rider caps and extending over three bents. They are to be fastened to the bents by two 1-inch bolts, 38 inches long in each end bearing and two 1-inch bolts 36 inches long in the middle bearing. A 4-inch block is to be placed under the girder caps at each bearing to receive the ends of the bolts. A floor 6

inches thick and 2½ feet square is to be laid across the stringers over the middle bearing. It is to be gained down into the stringers 2 inches and fastened to them by 10-inch steel wire spikes. Each post to be fitted to its foundation and bolted to it by four 1½-inch screw bolts with large counter-sunk heads, filling and rounding above the holes in the base of the casting, with heavy washers under the nuts, the bolts to extend through the timber foundation.

Riprap.

Stone riprap consisting of granite quarry chips, weighing from 10 to 300 lbs., to be placed around and among the piles of the platform and against the face of the wall at such times and places and in such quantities as the Engineer may direct.

The quantity of riprap used shall be determined by weight, and if brought to the work in vessels shall be determined by the Engineer from marks placed on the vessel by a legally qualified weigher, whose sworn certificate of the correctness of such marks at a recent date shall be furnished to the Engineer by the Contractor before the delivery of the first cargo of stone by such vessel. If deemed necessary by the Engineer, the weight marks of any such vessel may at any time be verified under his direction at the expense of the Contractor.

If the stone riprap is brought to the work in any other way, the Contractor is to provide a method of determining the weight, which shall be satisfactory to the Engineer.

Plane of Reference.

The plane of mean low water to which all elevations and grades mentioned in these specifications are referred is that established and used in the work of the improvements by the Commonwealth on the South Boston Flats.

Other Contracts.

It is hereby mutually agreed that as the work under the contract for constructing the solid portion of the pier or wharf may not be fully completed before the beginning of the work under this contract, due regard shall be maintained for the rights and conveniences of the parties working under each contract, and as far as possible nothing shall be done to hinder or delay the progress of the work under either contract, but on the other hand each party will do everything that under the circumstances is reasonably right and proper to facilitate the work of the other.

GENERAL CLAUSES.

The work shall be done so as not to interfere with the use of the wharf and dock of the New England Railroad Company, which adjoin the location of the platform herein contracted for.

Upon the completion of the work the Contractor is to remove from the premises all materials and refuse left from the construction, and to leave the premises in a condition satisfactory to the Engineer.

The aforesaid plans, and the surveys with the calculations based thereon, are believed to be correct; but the Contractor must examine for himself, as no allowance will be made for any errors or inaccuracies which may be found therein, and the Commonwealth does not guarantee them to be even approximately correct.

The drawings and specifications are intended to be explanatory of each other; but should any discrepancy appear, or misunderstanding arise as to the import of anything contained in either, the explanation and determination of the Engineer shall be considered final and binding on the Contractor. Any errors or omissions in drawings or specifications may be corrected by the Engineer, such correction to govern all work only from the time that the Engineer gives notice in writing thereof.

In all questions which may arise concerning measurement, lines and grades, or of interference with other work or contractors, the decision of the Engineer to be final. All lines and grades will be given by the Engineer, but all necessary aid and materials for giving or indicating them to be furnished by the Contractor at his own expense, and the marks given shall be carefully preserved.

Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall, on demand, be at once removed from the work.

Any unfaithful or imperfect work which may be discovered before the final acceptance of the completed structure shall be corrected immediately, and any unsatisfactory materials delivered shall be rejected on the requirement of the Engineer, notwithstanding that they may have been overlooked in previous inspection. The inspection of the work shall not relieve the Contractor of any of his obligations to perform good work as herein described; and all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be removed and replaced by good and satisfactory work at the expense of the Contractor, and all completed work shall be maintained by him in good condition until the final acceptance of the whole work.

The Contractor hereby agrees to do such extra work in connection with the construction of the platform as may be ordered in writing by the Board of Harbor and Land Commissioners, and to accept in payment for the same, its reasonable cost as estimated by the Engineer, plus 15 per centum of said estimated cost.

The Contractor shall have no claim for compensation for extra work unless the same is ordered in writing by said Board, and unless the claim for the same is presented to said Board before the fifteenth day of the month following that during which each specific order is complied with.

Convenient facilities for the inspection of the work shall be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of that particular work in reference to which they are given. All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board and not otherwise.

The work is to be commenced as soon as in the opinion of the Engineer the work of building the solid portion of the pier or wharf has advanced far enough to allow the work on the platform to be carried on without material delays or interruptions caused by that work, and the platform shall be completed as soon as practicable but not later than July 1, 1900.

In all operations connected with the work the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work; and in the employment of mechanics and laborers in the construction of the work herein contracted for preference shall be given by the Contractor to citizens of the United States.

The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the Contractor or his employees in doing the work, or in consequence of any improper materials,

implements or labor used therein, or relating to any act, omission or neglect of the Contractor or his employees therein.

In no event whatever shall the Contractor be entitled to any compensation from the Commissioners, their servants or agents, on account of any acts or omissions under or growing out of this contract.

If the work to be done under this contract shall be abandoned by the Contractor, or if the Engineer at any time shall be of opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work, and the Contractor shall thereupon discontinue said work, and the Commonwealth may, after the said notice, complete the work by contract or otherwise, and may pay the expense of the same, so far as may be, out of any moneys then due or to become due the Contractor under this contract. In case such expense is less than the sum which would have been payable under this contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case the expense shall exceed said sum, the Contractor shall pay the amount of such excess to the Commonwealth.

The Harbor and Land Commissioners, for the Commonwealth, may retain out of any amounts due the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others for work done or materials furnished under this contract; *provided*, that notice in writing of such claims, signed by the claimants, shall have been previously filed with the Commissioners.

Estimates are to be made by the Engineer at the end of each calendar month of the value of the work completed in place, and payment to be made thereon of 85 per centum of the value of said work, as computed by the Engineer, the remaining 15 per centum to be paid upon the final completion and acceptance of the whole work, except as hereinbefore provided.

And when the Contractor shall have performed said work in the manner and in accordance with the terms and conditions aforesaid, the Commonwealth of Massachusetts will pay the Contractor the sum of ($119,872.00) one hundred and nineteen thousand eight hundred and seventy-two dollars for the pile and timber platform and ($1.00) one dollar for each ton (2,000 lbs.) of stone riprap furnished and placed as hereinbefore prescribed, these amounts to be in full compensation for all the labor and materials done, furnished, performed and completed under this contract, the payments

to be made at the times and in the manner and upon the terms and conditions hereinbefore set forth.

In Witness Whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be executed and delivered under the seal of the Commonwealth with the approval of the Governor and Council; and the said George A. Cahill has hereunto set his hand and seal.

THE COMMONWEALTH OF MASSACHUSETTS,

By Woodward Emery,
Clinton White,
Chas. C. Doten,
} *Harbor and Land Commissioners.*

[seal.] GEORGE A. CAHILL.

Commonwealth of Massachusetts.

In Council, March 8, 1899.

Approved: Edward F. Hamlin,
Executive Secretary.

Witness the seal of the Commonwealth:

[seal of the commonwealth.]

Wm. M. Olin,
Secretary of the Commonwealth.

[B.]

[See page 8 of this report, *ante*.]

CONTRACT.

ARTICLES OF AGREEMENT MADE THIS SEVENTEENTH DAY OF MAY, IN THE YEAR EIGHTEEN HUNDRED AND NINETY-NINE, BY AND BETWEEN THE COMMONWEALTH OF MASSACHUSETTS, ACTING BY THE BOARD OF HARBOR AND LAND COMMISSIONERS WITH THE APPROVAL OF THE GOVERNOR AND COUNCIL, AND DANIEL E. LYNCH OF BOSTON IN THE COUNTY OF SUFFOLK AND COMMONWEALTH AFORESAID HEREINAFTER DESIGNATED AS THE CONTRACTOR.

The Contractor hereby covenants and agrees with the Commonwealth to provide all the labor and materials and to do and complete all the work necessary and proper to drain, pave and regulate Fargo Street on the Commonwealth Flats at South Boston from B Street across C and D streets to E Street, and E Street from the end of Fargo Street to Summer Street extension, all the work to be done and completed in the manner and in accordance with and subject to the terms and conditions set forth in the following specifications.

The word "Engineer" when used herein, shall mean the Engineer of the Board of Harbor and Land Commissioners, acting directly or through his properly authorized agents, when within the scope of the particular duties intrusted to them.

SPECIFICATIONS.

The Contractor is to furnish all the plant, tools, appliances, labor and materials necessary to drain, pave and regulate the streets as follows: —

SECTION 1. (*a*) Construct catch-basins and man-holes at points which are designated by the Engineer, with drains connecting them with existing sewers or extend the drains to a point or points where they can discharge into tide-water. Set edgestones and pave with granite blocks the roadway throughout the length of Fargo and a portion of E streets to make a continuous paved street from B street to Summer street extension, removing all old

materials from the site of the work and depositing those required to be kept for the Commonwealth in the vicinity of the work as directed by the Engineer, and furnishing and doing to the satisfaction of the Engineer everything required for the work.

(*b*) Carefully protect the work from injury from water, frost, accident or other cause, and repair any such injury; make good any defect, omission or mistake in the work within such time as shall be required in any notice so to do signed by the Engineer and given to the Contractor or mailed to him at the business address stated by him in his proposal, whether so given or mailed during the progress of the work or after its completion, and whether any inspection or approval of, or payment for, the work or any part thereof may have been made or certificate for such payment be given.

(*c*) Take charge of and be liable for any loss of or injury to any materials delivered on, or in the vicinity of, the work to be used thereon; notify the Engineer as soon as any such materials are so delivered, and furnish men to handle them for examination by the Engineer or his assistants; and keep trimmed up in piles so placed as not to endanger the work all such materials, and all refuse, rubbish and other materials not removed, and pay all charges and fees incident to the doing of the work.

(*d*) Leave an unobstructed way along public and private ways for travellers, street cars and teams, and for access to hydrants; from the beginning of twilight throughout the whole of every night maintain near all places in the public ways obstructed or made unsafe by the Contractor, sufficient lights to protect travellers in such ways from injury; provide proper walks for travellers over and around such places; provide and use all other lights, fences, guards and watchmen on and about the work as directed by the Engineer; provide all necessary bridges and ways for access to property where the existing access is cut off by the Contractor, and see that the neighboring residents are not unnecessarily inconvenienced; take all proper precautions to protect persons and property from injury by the carrying on of the work.

(*e*) Replace or put in good condition satisfactory to the Engineer any public or private way, or sewer or drain, or water, gas or other pipe or catch-basin, wire, building, fence, or other structure interfered with by the Contractor, and not required to be removed under this contract.

(*f*) Keep, as the property of the Contractor, and promptly remove from the work and its vicinity all materials rejected and directed by the Engineer or his assistant to be set aside, and the surplus of the refuse, rubbish and rejected materials, except such

rejected and other materials, refuse and rubbish as shall be provided for in these specifications, and such as the Engineer shall notify the Contractor that the Commonwealth will require.

(*g*) Maintain the flow in all the water-courses, sewers, drains, and pipes interfered with by the Contractor, or convey the flow in covered channels to a suitable point of discharge, in such a manner as not to flow upon or hinder the other work or cause any nuisance.

(*h*) The Contractor in doing the above shall, so far as they go, conform to these specifications and the plans and drawings of the work furnished by the Engineer, all orders in writing of said Engineer or of said Board, increasing the quantity or taking away any part of the work, or making any change in the form, materials, plans or specifications of the work, or requiring the Contractor to furnish any extra work or materials relating to the above; and shall cause all directions relating to the work, given by the Engineer, to be promptly carried out, and everything to be completed on or before October 1, 1899.

(*i*) All the filling required on the streets below the foundations of the paving and curbing will be done by the Commonwealth, but all trimming, levelling or removal of surplus material required to prepare the surface for the work herein contracted for must be done by the Contractor.

Drainage.

Excavations.

Section 2. (*a*) The excavations are to be made to the grades and lines given by the Engineer, and to such further depths and widths and in such manner as will give ample room for building the structures to be placed thereon, and room for pumping, draining and removing any material which the Engineer may not deem proper for a foundation.

(*b*) The grade line is the line to which the excavations are to be made, and is as follows: Where concrete foundation is used it is the under side of the concrete; where timber foundation is used it is the under side of the platform or sills; where no foundation is used it is the under side of the lowest part of the sewer, pipe or other structure to be placed therein.

(*c*) If the Engineer shall determine that the material at or below the grade line is of improper nature for a foundation, it is to be removed to such other depths and widths and in such manner as he may direct.

(*d*) All excavations below the grade line are to be refilled to said line with such material and in such manner as the Engineer shall direct.

(*e*) The excavations are to be kept free from water at all times, and pumps are to be used and shifted frequently to avoid drainage from too long a distance.

(*f*) All excavations are to be maintained in good order at all times so as not to hinder or injure the other work, and are to be protected by sheeting and shoring so as to prevent caving or bulging; such sheeting and shoring to be left in place if, and as, directed by the Engineer, and if such sheeting and shoring is removed, it is to be removed in such a manner as to prevent caving in of the sides of the excavation.

Foundations.

Section 3. (*a*) The foundation at any given point cannot be determined in advance, but is to be decided upon, and may be changed, by the Engineer, as occasion demands.

(*b*) If a timber foundation is used it is to consist of sills, laid as directed, and a platform or flooring of plank, spiked to each sill with suitable spikes, and great care is to be exercised to prevent any washing away of the materials under the timber. On this concrete will be placed of the shape and dimensions shown on the plan.

Concrete.

Section 4. (*a*) All concrete is to be made in proper boxes just before being used, and is to be used in the foundations and side-walls as shown on the plans or as directed by the Engineer.

(*b*) The concrete is to be prepared from American hydraulic cement and sand and gravel of various sizes, free from clayey or other objectionable materials; no stone is to be more than two and one-half inches, and but very few less than one-fourth inch in greatest dimension.

(*c*) These ingredients are to be mixed in a manner approved by the Engineer, in the proportion of one part, by measure, of cement, to two parts of sand, and five parts of gravel or broken stones, and after the materials are wet the work must proceed rapidly until the concrete is in place and is so thoroughly rammed that all of the interstices between the stones are entirely filled with mortar, and water flushes to its surface.

(*d*) The concrete is to be laid in layers six inches in thickness, unless otherwise directed by the Engineer; each layer to be allowed to set for a sufficient time to be determined by the Engineer before walking over or making additions to it.

(*e*) In case any dirt or other objectionable material shall in any way get on to any layer it is to be carefully and entirely removed before the next layer of concrete is put on.

(*f*) Where forms are required to hold the concrete in place they are to be set true to the lines, and firmly secured, so that they will not get out of place while the concrete is being laid.

(*g*) Should voids be discovered in any concrete when the forms are taken down the defective work is to be removed, and the space refilled with suitable materials.

Appurtenances.

SECTION 5. (*a*) The man-holes and catch-basins are to be constructed of hard brick, laid in American hydraulic cement mortar to a line with the beds in the line of the radii of the curves, and with as close joints, not exceeding one-quarter inch for face work, as may be from time to time directed, and are to stand on a foundation of concrete or of timber and concrete as directed by the Engineer. The man-holes are to be capped by a cast-iron frame and cover. The catch-basins to be capped by a cast-iron D shaped frame and grate and a gutter-mouth is to be cut in the edgestone over each catch-basin, the top of the catch-basin, back of the edgestone to be covered by a stone slab. Wrought-iron steps are to be built into the sides of all man-holes and catch-basins as directed by the Engineer. The cast-iron frames, grates and covers and the iron steps are to be in every respect like those used for the same purpose by the city of Boston.

(*b*) The mortar is to be made in proper boxes just before being used, and no mortar is to be used that has become hard or set; it is to be prepared from cement and clean, sharp sand, free from loam and pebbles; these ingredients are to be thoroughly mixed dry in a manner approved by the Engineer, and in the following proportions: one part by measure of cement, to one and one-half parts of sand.

(*c*) Each brick, in laying brick masonry, is to be thoroughly wetted just before laying, and is to be completely imbedded in mortar under its bottom, on its sides, and on its ends, at one operation; care is to be taken to have every joint full of mortar, the hardest and most regular of the bricks are to be used for the inverts of manholes and bottoms of the catch-basins.

(*d*) No masonry is to be laid in water; no water is to be allowed to rise on any masonry until it has set at least twenty-four hours; and no drainage is to be effected over or through any drain without permission from the Engineer.

Pipes.

SECTION 6. (*a*) The pipes for the drains are to be the best Portland or Akron salt glazed sewer pipes, sound, straight, true in

shape and size and free from all imperfections; they are to be laid with Portland cement mortar joints and a closely fitting disc drawn through each two lengths of pipe and the joint left free from all obstructions.

(*b*) The pipes are to be evenly bedded so that no uneven strain will come on any pipe, and especial care is to be taken to prevent the pipes bearing on the joints.

(*c*) The pipes are to be made water tight, and if directed by the Engineer, the joints are to be calked with oakum.

(*d*) The pipes are to be connected with the catch-basins, manholes and sewers in such manner as may be directed by the Engineer.

(*e*) All pipe is to be laid under the personal direction of the Inspector, and no line of pipe is to be covered until it has been examined by the Inspector in charge of the work, and directions given to cover the same.

(*f*) Wherever Y's or slants are placed in existing pipes or other structures, sufficient of the old work is to be removed therefor, and all mason work is to be done which is necessary to make up the joint in a good and workmanlike manner.

Refilling.

Section 7. (*a*) The greatest care is to be taken in refilling; the best of materials taken from the excavations are to be used.

(*b*) Good sand or fine gravel, entirely free from large stones, is to be carefully rammed and puddled beneath and around the pipes and other structures, special care being taken not to injure the alignment of the structure.

(*c*) The other parts of the refilling are to be spread in thin layers, well watered and thoroughly rammed.

(*d*) No mud or other objectionable material is to be used for refilling, unless otherwise authorized in writing by the Engineer.

Outlet and Tide-gates.

Section 8. (*a*) The outlet is to be through the granite seawall at the westerly end of the Reserved Channel.

(*b*) Enough of the wall to be taken down to allow the pipe to be laid through it, and after the pipe is laid is to be rebuilt and left as found.

(*c*) The pipe to be 24 inches in diameter and to be laid in Portland cement concrete through the wall except at the face of the wall, where it is to be surrounded by brick or stone masonry laid in Portland cement mortar.

as may be found in the excavation of the roadway, rolled or otherwise compacted to bring the surface even with the top of the edgestones.

Gravel Base.

SECTION 13. A gravel base for the stone paving is to be laid in the excavation for the roadway and is to consist of fine paving gravel that will pass through a screen with three-quarters ($\frac{3}{4}$) inch round openings, and very few that will pass through a screen with one-quarter ($\frac{1}{4}$) inch round openings, thoroughly rammed into a solid layer so as to be four (4) inches deep when completed.

Granite Block Paving.

SECTION 14. (*a*) The blocks to be used for paving are the standard granite paving blocks used by the street department of the city of Boston. They are to be of the best Cape Ann or Maine granite, equal in finish to the sample block kept in the office of the Superintendent of Streets of the city of Boston. Each block is to be three and one-half ($3\frac{1}{2}$) to four and one-half ($4\frac{1}{2}$) inches wide; seven and one-half ($7\frac{1}{2}$) to eight (8) inches deep, and nine (9) to fourteen (14) inches long, averaging not less than eleven and one-half ($11\frac{1}{2}$) inches; the edges are to be sharp and straight, forming right angles at their intersections, both horizontally and vertically, and the faces are to be straight-split and free from bunches and depressions exceeding one-half ($\frac{1}{2}$) inch.

(*b*) Upon the gravel base is to be laid a foundation of bedding sand, and in this sand the granite paving blocks in courses of uniform width and depth are to be laid at right angles with the line of the street, unless otherwise directed by the Engineer, and with close joints, the longitudinal joints broken by a lap of at least two (2) inches, sufficient sand being used to bring the blocks to the grade and form for the finished roadway after they have been thoroughly rammed as hereinafter provided.

(*c*) The blocks are to be covered with clean, fine-screened gravel, or coarse sand, the sand and gravel to be thoroughly dried by artificial heat, if necessary, and raked and swept until the joints of the blocks are filled therewith; the blocks are then to be thoroughly rammed to a firm, unyielding bed, their surface parallel to the grade and crown required, and are then to be again covered, and the covering raked or swept as aforesaid; the blocks are then to be again rammed until they are solid and secure at the grade and crown of the finished roadway; the entire area is then to be covered with a layer of the same gravel at least one (1) inch thick. No ramming is to be done within ten (10) feet of the face of the

paving that is being laid, and in doing the ramming one (1) rammer is to be employed to every two pavers.

Catch-basin and Man-hole Covers.

SECTION 15. (*a*) All existing catch-basin and man-hole covers are to be reset when necessary to conform to the line and grade required.

Flagging Cross-walks.

SECTION 16. (*a*) The flagging for the cross-walks is to be of granite flagging stone, each stone exactly two feet in width, not less than four feet in length, of the same thickness as the others, not less than six (6) inches nor more than seven (7) inches of the best grade and quality, of uniform color, the top to be rough pointed, and the ends jointed and square cut to the full depth of the stone.

(*b*) In the excavation for a cross-walk is to be laid a foundation for the flagging stones, of fine gravel and pebbles, free from stones larger than three-quarters ($\frac{3}{4}$) of an inch in greatest dimension, and thoroughly rammed into a solid layer, so as to be four (4) inches thick when completed.

(*c*) On this foundation other gravel of the same kind is to be spread, and the flagging laid therein and thoroughly rammed to a solid and unyielding bed, sufficient gravel being used to bring the surface of the stones to the grade and crown of the finished highway after being so rammed.

General Clauses.

SECTION 17. (*a*) The Contractor is not to assign or sub-let the work, but is to keep the control and charge of the work and of every part thereof, and give his personal supervision thereto, unless with the consent of the Engineer in writing; or shall keep a competent foreman always present when anything is being done on the work; and shall allow all other persons doing work for the Commonwealth free access thereto and shall not interfere with them in their work.

(*b*) All regulations of law or public authorities, controlling or limiting the method or materials to be used, or the actions of those employed in doing the work, are to be carefully observed, and all necessary permits are to be taken out, and all notices required are to be given.

(*c*) Figure dimensions in preference to scale dimensions are to be followed in all plans and drawings, and in case of any discrepancy between the figures and scale, or the drawings and specifications, the matter is to be submitted to the Engineer for

adjustment, and any work done by the Contractor before such adjustment is made shall, if the Engineer so requires, be replaced by work satisfactory to him.

(*d*) The lines and marks for the work are to be given by the Engineer, and the Contractor is to place, preserve and conform to the same.

(*e*) When for any reason the work is suspended, all the work is to be protected, and the roadways and sidewalks left unobstructed, and in a safe and satisfactory condition.

(*f*) Upon the completion of the work the Contractor is to remove from the premises all materials and refuse left from the construction, and to leave the premises in a condition satisfactory to the Engineer.

(*g*) Any unfaithful or imperfect work which may be discovered before the final acceptance of the completed structure shall be corrected immediately, and any unsatisfactory materials delivered shall be rejected on the requirement of the Engineer, notwithstanding that they may have been overlooked in previous inspection. The inspection of the work shall not relieve the Contractor of any of his obligations to perform good work as herein described; and all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be removed and replaced by good and satisfactory work at the expense of the Contractor, and all completed work shall be maintained by him in good condition until the final acceptance of the whole work.

(*h*) The Contractor hereby agrees to do such extra work in connection with the drainage, paving and regulating, as may be ordered in writing by the Board of Harbor and Land Commissioners, and to accept in payment for the same, its reasonable cost as estimated by the Engineer, plus 15 per centum of said estimated cost and to furnish any material which may be required for carrying out said extra work at its actual reasonable cost to the Contractor.

(*i*) The Contractor shall have no claim for compensation for extra work unless the same is ordered in writing by said Board, and unless the claim for the same is presented to said Board before the fifteenth day of the month following that during which each specific order is complied with.

(*j*) Convenient facilities for the inspection of the work shall be furnished by the Contractor whenever requested by the Engineer. All instructions and directions of the Engineer to be strictly observed and followed, and when the Contractor is not present to receive them, they shall be received and obeyed by the superintendent or foreman who may have charge of that particular work

in reference to which they are given. All of the work to be done to the satisfaction of the Engineer, and with such machinery and appliances, and by such methods, as shall be approved by him, and to the acceptance of said Board and not otherwise.

(*k*) The work is to be commenced at once and shall be completed as soon as practicable but not later than Oct. 1, 1899.

(*l*) In all operations connected with the work the Contractor shall comply with all laws or regulations affecting in any way the conduct of those engaged on the work, or the methods of doing the work, and persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and said nine hours shall constitute a day's work; and in the employment of mechanics and laborers in the construction of the work herein contracted for preference shall be given by the Contractor to citizens of the United States.

(*m*) The Contractor shall take all responsibility of the work and take all precautions for preventing injuries to persons and property in or about the work, and shall assume the defence of and indemnify and save harmless the Commonwealth, its officers and agents, from all actions at law and claims relating to labor or materials furnished for the work, or to inventions, patents or patent rights used in doing the work, or to injuries to any person or corporation received or sustained by or from the Contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein, or relating to any act, omission or neglect of the Contractor or his employees therein.

(*n*) In no event whatever shall the Contractor be entitled to any compensation from the Commissioners, their servants or agents, on account of any acts or omissions under or growing out of this contract.

(*o*) If the work to be done under this contract shall be abandoned by the Contractor, or if the Engineer at any time shall be of opinion, and shall so certify in writing to said Board of Harbor and Land Commissioners, that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor is violating any of the provisions of this contract, said Board may notify the Contractor to discontinue the work, and the Contractor shall thereupon discontinue said work, and the Commonwealth may, after the said notice, complete the work by contract or otherwise, and may pay the expense of the same, so far as may be, out of any moneys then due or to become due the Contractor under this contract. In case such expense is less than the sum which would have been payable under this contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case the expense

shall exceed said sum, the Contractor shall pay the amount of such excess to the Commonwealth.

(*p*) The Harbor and Land Commissioners, for the Commonwealth, may retain out of any amounts due the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others for work done or materials furnished under this contract; *provided*, that notice in writing of such claims, signed and sworn to by the claimants, shall have been previously filed with the Commissioners.

(*q*) Estimates are to be made by the Engineer at the end of each calendar month of the value of the work completed in place, and payment to be made thereon of 85 per centum of the value of said work, as computed by the Engineer, the remaining 15 per centum to be paid upon the final completion and acceptance of the whole work, except as hereinbefore provided.

And when the Contractor shall have performed said work in the manner and in accordance with the terms and conditions aforesaid, on that part of Fargo Street lying between B and C streets and D and E Streets and E Street from the end of Fargo Street to Summer Street extension, the Commonwealth of Massachusetts will pay the Contractor therefor the following prices.

Item 1. — For each linear foot of 10-inch pipe drain furnished and laid, the sum of sixty-two cents ($0.62).

Item 2. — For each linear foot of 12-inch pipe drain furnished and laid, the sum of seventy cents ($0.70).

Item 3. — For each linear foot of 18-inch pipe drain furnished and laid, the sum of one dollar and ten cents ($1.10).

Item 4. — For each linear foot of 24-inch pipe drain furnished and laid, the sum of two dollars and eighty cents ($2.80).

Item 5. — For each linear foot of timber and concrete foundation furnished and laid under 10-inch pipe drain, the sum of forty-seven cents ($0.47).

Item 6. — For each linear foot of timber and concrete foundation furnished and laid under 12-inch pipe drain, the sum of fifty-two cents ($0.52).

Item 7. — For each linear foot of timber and concrete foundation furnished and laid under 18-inch pipe drain, the sum of sixty-four cents ($0.64).

Item 8. — For each linear foot of timber and concrete foundation furnished and laid under 24-inch pipe drain, the sum of one dollar and five cents ($1.05).

Item 9. — For each catch-basin built, including all materials for its construction, the sum of ninety dollars ($90.00).

Item 10. — For each man-hole built, including all material for its construction, the sum of fifty dollars ($50.00).

Item 11. — For each linear foot of straight edgestone furnished and set, the sum of eighty-five cents ($0.85).

Item 12. — For each linear foot of curved edgestone furnished and set, the sum of ninety cents ($0.90).

Item 13. — For each square yard of granite block paving furnished and laid with gravel joints, the sum of one dollar and ninety-five cents ($1.95).

Item 14. — For each square yard of granite cross-walks furnished and laid with gravel joints, the sum of four dollars ($4.00).

Item 15. — For furnishing material and building outlet for drain through sea-wall at head of Reserved Channel, including double man-hole with tide-gates, the sum of seven hundred and eighty dollars ($780.00).

These amounts to be in full compensation for all the labor and materials done, furnished, performed and completed as aforesaid, including all incidental work, the payments to be made at the times and in the manner and upon the terms and conditions hereinbefore set forth. It being understood and agreed that the Contractor shall collect payment of the city of Boston for the performance of his contract on that part of Fargo Street lying between and across C and D streets, and shall make no claim against the Commonwealth on account thereof.

In Witness Whereof, on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these presents to be executed and delivered under the seal of the Commonwealth with the approval of the Governor and Council; and the said Daniel E. Lynch has hereunto set his hand and seal.

THE COMMONWEALTH OF MASSACHUSETTS,

By Woodward Emery,
Clinton White,
Chas. C. Doten,
Harbor and Land Commissioners.

[seal.] DANIEL E. LYNCH.

Commonwealth of Massachusetts.

In Council May 24, 1899.

Approved: E. F. Hamlin,
Executive Secretary.

Witness the Seal of the Commonwealth:

Wm. M. Olin,
Secretary of the Commonwealth.

[seal of the Commonwealth.]

380171

[C.]

[See page 6 of this report, *ante*.]

LEASE.

THIS INDENTURE, made the twenty-seventh day of November eighteen hundred and ninety-nine, between the Commonwealth of Massachusetts, acting by its Board of Harbor and Land Commissioners, of the first part, and Charles Taft Chapin of Boston in the County of Suffolk and Commonwealth aforesaid, of the second part,

WITNESSETH, That the said party of the first part doth hereby demise and lease unto the said party of the second part a parcel of land situate in Boston, bounded and described as follows, to wit:

Beginning at a point in the southerly line of E street as now built distant fifty-five (55) feet westerly from its intersection with the south-westerly line of Summer street; thence southerly at right angles with said line of E street, two hundred and eighty-three and ninety-eight hundredths (283.98) feet to the face of the sea-wall on the northerly side of the Reserved Channel; thence westerly along the face of said sea-wall, two hundred and sixty-four (264) feet; thence northerly at right angles with said line of E street, two hundred and eighty-three and ninety-eight hundredths (283.98) feet to the southerly line of E street; thence easterly by said southerly line of E street two hundred and sixty-four (264) feet to the point of beginning: Together with the flats in front of said parcel, three hundred (300) feet to the Reserved Channel; also including the pile wharf now building over a portion of said flats and the right to use the dock fifty (50) feet wide adjoining the east side thereof.

To have and to hold the same for the term of fifteen years, beginning with the first day of May next.

Yielding and paying therefor rent, at the rate of four thousand (4,000) dollars yearly, by equal half-yearly payments as follows, to wit: Two thousand (2,000) dollars on the thirtieth day of April, the same sum on the thirty-first day of October in every year during said term, and at that rate for such further time as the said lessee, or any other person or persons claiming under him shall hold the said premises or any part thereof; the first payment to be made on the thirty-first day of October A.D. nineteen hundred.

And the said lessor covenants and agrees with the said Lessee and his representatives, that he or they paying the rent aforesaid, and performing the covenants herein contained, on his or their part to be paid or performed, shall peaceably hold and enjoy the said premises without hindrance or interruption by the said Lessor or any person or persons whomsoever.

And the said lessee for himself and his assigns hereby covenants with and to the said Lessor that he will, during the said term, and for such further time as the said Lessee or any other person or persons claiming under him, shall hold the said premises, or any part thereof, pay unto the Lessor the said yearly rent upon the days hereinbefore appointed for the payment thereof, and also all the taxes, water rates and assessments whatsoever, whether in the nature of taxes now in being or not, which may be payable for or in respect of the said premises, or any part thereof during said term, and for such further time as the said Lessee or any person or persons claiming under him shall hold the said premises or any part thereof: excepting, however, assessments for any permanent benefit or improvement to said premises under any betterment law or otherwise, upon which, however, if made, he agrees to pay to the Lessor interest at six per centum per annum on the total amount thereof, payable at the times herein specified for the payment of rent; And, also will keep all and singular the said premises in such repair as the same are in at the commencement of said term, reasonable use and wear, and damage by accidental fire or other inevitable accidents only excepted.

And the said Lessee further covenants and promises with and to the said Lessor that he or others having his estate in the premises will not assign this lease nor underlet the whole or any part of the said premises, nor make nor allow to be made any unlawful, improper or offensive use thereof; nor do any dredging upon said premises without the consent of the said Board first being obtained in writing, allowing thereof; And, That it shall be lawful for the said Board at seasonable times to enter into and upon the same to examine the condition thereof; And, further, that the said Lessee and his assigns shall and will be responsible and will pay all damages and charges to the City Government or others for any nuisance made or suffered on the premises during said term: And, further, that the said Lessee and his assigns shall and will at the expiration of said term peaceably yield up unto the said Lessor all and singular the premises in good tenantable repair in all respects, reasonable wearing and use thereof and damage by fire or other casualties excepted.

And provided always, and these presents are upon this condition,

that in case of a breach of any of the conditions to be observed on the part of the Lessee or those claiming under him or in case the estate hereby created shall be taken from him or them by process of law, by proceedings in bankruptcy or insolvency or otherwise, the Lessor may, while default or neglect continues or at any time after such taking by process of law and notwithstanding any license or waiver of any prior breach of condition, without notice or demand, enter upon the premises and thereby determine the estate hereby created, and may thereupon expel and remove forcibly, if necessary, the Lessee and those claiming under him and their effects;

But it is agreed that in case of loss or damage by fire or other unavoidable casualty to the wharf aforesaid so that the same shall be rendered unfit for use and occupation, that a just and proportionate part of the rent hereinbefore reserved shall be abated until the same shall have been duly repaired and restored by the Lessor.

It is further understood and agreed that the Lessee and his assigns may erect structures suitable for their business on said premises and may remove the same at the expiration of this lease, but all such structures shall be and exist without charge or liability to the Lessor for creation or destruction from whatever cause.

In Witness Whereof on the day and year first above written, the Commonwealth of Massachusetts, by the Board of Harbor and Land Commissioners, has caused these Presents to be executed and delivered under the seal of the Commonwealth, with the approval of the Governor and Council; and the said Charles Taft Chapin has hereto set his hand and seal.

[seal] CHARLES TAFT CHAPIN.

THE COMMONWEALTH OF MASSACHUSETTS,

By Woodward Emery,
Clinton White,
Chas. C. Doten,
} *Harbor and Land Commissioners.*

Approved in Council Dec. 6, 1899.

E. F. Hamlin,
Executive Secretary.

Witness the Seal of the Commonwealth:

Wm. M. Olin,
Secretary of the Commonwealth.

[seal of the commonwealth.]

[D.]

[See page 20 of this report, *ante*.]

VOTES OF THE BOARD OF HARBOR AND LAND COMMISSIONERS, PASSED NOV. 17, 1899.

WHEREAS, the Board of Harbor and Land Commissioners is authorized, under St. 1898, c. 278, entitled "An Act to change the harbor lines and provide for the improvement of South Bay in the city of Boston," as amended by St. 1899, c. 469, entitled "An Act relative to the improvement of Boston harbor," to take from time to time, for the purposes stated in said acts, the whole or a portion of the area lying between the harbor lines in South Bay;

AND WHEREAS, the Board has considered the takings and improvements authorized by said acts, and has decided upon and adopted a general scheme or plan to be carried out by it under the authority of said acts;

VOTED: That the plan now before the Board, marked "Commonwealth of Massachusetts, Harbor and Land Commissioners' Office. Plan of Soundings in South Bay. Boston Harbor. April, 1898. Scale $\frac{1}{1000}$," and in red, "Scheme for the improvement of South Bay by dredging the area shown on this plan included between Dover Street Bridge and the brown lines A-B-C-D-E-F-G-H. Adopted November 17, 1899, by the Board of Harbor and Land Commissioners, under the provisions of St. 1898, c. 278, and St. 1899, c. 469," signed by Woodward Emery, Clinton White and Chas. C. Doten, constituting the Board of Harbor and Land Commissioners, and by Frank W. Hodgdon, Engineer, be and the same hereby is approved and adopted as the scheme and plan which the Board contemplates carrying out; said scheme and plan contemplating the taking by the Board under said acts, absolutely in fee simple, free from all conditions and easements, subject to the approval of the Governor and Council, of that part of all that tract of land and flats now owned by the Commonwealth, and all the rights, easements, title and interest of every name and nature, of all persons and parties whatsoever, except the Commonwealth, in and to every part and parcel of said tract lying in South Bay between Dover Street Bridge and the brown lines A-B-C-D-E-F-G-H.

VOTED: That the original of the plan aforesaid be kept on file in the official archives of this Board.

THE TAKING.

COMMONWEALTH OF MASSACHUSETTS,

IN BOARD OF HARBOR AND LAND COMMISSIONERS,

at its regular meeting held this twenty-second day of November in the year 1899, it was unanimously VOTED:

THAT WHEREAS, the undersigned Woodward Emery, Clinton White and Charles C. Doten, having been duly appointed and qualified according to the provisions of the laws of the Commonwealth of Massachusetts, do now constitute the Board known as the "Board of Harbor and Land Commissioners;" and

WHEREAS, by chapter 278 of the Acts passed by the General Court of said Commonwealth in the year 1898, entitled "An Act to change the harbor lines and provide for the improvement of South Bay in the city of Boston," as amended by chapter 469 of the Acts of the year 1899, entitled "An Act relative to the improvement of Boston harbor," said Board was authorized to take the land, flats and rights hereinafter described; and

WHEREAS, by a vote and plan adopted November 17 in the year 1899, the said Board adopted a plan and scheme for the improvement of said South Bay in the city of Boston, as shown more fully by said vote and said plan now on file in the public records of said Board;

NOW, THEREFORE, We, the said Board of Harbor and Land Commissioners, acting for the Commonwealth of Massachusetts, by virtue of and in the exercise and partial execution of the power and authority given us by said acts, and of any and every other power and authority us hereto in any wise enabling and for the purposes authorized by said acts, have adjudged and do hereby adjudge the following described land, flats and rights to be necessary to carry out the purposes of said acts, and have taken and do hereby take, absolutely in fee simple, free from all conditions and easements, under the provisions of chapter 278 of the Acts of the year 1898 as amended by chapter 469 of the Acts of the year 1899, in the name and behalf of the Commonwealth and with the approval of the Governor and Council, all that tract of land and flats and all the rights, easements, title and interest of every name and nature of all persons and parties whatsoever in and to every part and parcel of said tract which is situated in South Bay as aforesaid and bounded as follows:

Beginning at a point on the south-westerly side of the fender guard on the south-westerly side of Dover Street bridge fifty (50) feet westerly from the harbor line established by chapter 278 of

the Acts of 1898, on the easterly side of South Bay; thence running south-westerly nine hundred and twenty-seven feet (927) feet to a point two hundred and ten (210) feet south-easterly from said harbor line on the north-westerly side of the bay; thence continuing south-westerly about one thousand seven hundred and sixty (1,760) feet on lines parallel with and two hundred and ten (210) feet south-easterly from said harbor line on the north-westerly side of the bay to a point distant four hundred (400) feet north-easterly from that portion of said harbor line which is parallel with Swett Street; thence deflecting south-easterly seventy-seven (77) degrees and running south-easterly about two hundred and sixty-nine (269) feet to a point two hundred and ten (210) feet north-easterly from said harbor line parallel to Swett Street; thence south-easterly, more easterly, about seven hundred and seventy-five (775) feet parallel with and two hundred and ten (210) feet distant north-easterly from the said portion of said harbor line parallel with Swett Street to a point fifty (50) feet distant north-westerly from the portion of said harbor line parallel with the New England Railroad; thence south-westerly about one hundred and sixty-three (163) feet; thence north-westerly about one thousand three hundred and forty-two (1,342) feet; and thence north-easterly about three thousand one hundred and eight (3,108) feet, all on lines parallel with and fifty (50) feet distant from said harbor line to a point in the south-westerly side of the draw-pier of Dover Street bridge distant fifty (50) feet south-easterly from said harbor line on the north-westerly side of the bay; thence by an irregular line following the outlines of the south-westerly side of Dover Street bridge and its appurtenances, to the point of beginning:

Comprising lands, besides those owned by the Commonwealth, supposed to belong to the West End Street Railway Company, Windsor Cement Company, Frank B. Tallman, Edward O'Brien, C. W. Leatherbee, Heirs of Edward F. Meany, Charles S. Waldo, Ham & Carter Company, Amelia B. Rowe, John W. F. Hobbs, City of Boston, Heirs of Joseph Dorr *et al.*, and Roxbury Central Wharf; but all names of owners herein stated, although believed to be correct, are given only as matters of information and belief.

Said premises are shown as included within red lines on a plan entitled "Commonwealth of Massachusetts, Harbor and Land Commissioners' Office. Plan of flats in South Bay, Boston, taken by the Board of Harbor and Land Commissioners under Statutes 1898, Chapter 278, as amended by Statutes 1899, Chapter 469," of even date herewith, signed by said Commissioners and by Frank W. Hodgdon, Engineer of Board, and to be recorded herewith.

All the foregoing described lands and flats and all the rights of all persons therein or included in the above description are taken under the provisions of chapter 278 of the Acts of 1898, as amended by chapter 469 of the Acts of 1899, in the name and behalf of the Commonwealth.

WITNESS the hands of the Board of Harbor and Land Commissioners acting for and in behalf of the Commonwealth of Massachusetts, this twenty-second day of November in the year of our Lord one thousand eight hundred and ninety-nine.

WOODWARD EMERY,
CLINTON WHITE,
CHAS. C. DOTEN,
Harbor and Land Commissioners.

Approved by order of the Executive Council, Nov. 29, 1899.

EDWARD F. HAMLIN,
Executive Secretary.

Witness the Seal of the Commonwealth:

WM. M. OLIN,
Secretary of the Commonwealth.

[SEAL OF THE COMMONWEALTH.]

[E.]

[See page 47 of this report, *ante*.]

REPORT OF THE SUPERINTENDENT, PROVINCE LANDS.

PROVINCETOWN, MASS., Dec. 1, 1899.

To the Board of Harbor and Land Commissioners.

GENTLEMEN: — I respectfully submit the following report, covering operations on the Province Lands for the year ending Nov. 30, 1899: —

Active operations were begun about the first of April, and we have continued the work about on the same lines as during the last two or three seasons, by covering the barren surfaces or slopes of the sand hills with beach grass, and introducing young trees, shrubs and seeds in the section covered. The first work was the transplanting of young trees and shrubs along the slopes, which have been covered with beach grass during the past two or three seasons, embracing the following varieties: about 27,000 young pines, about equally divided, as follows: 9,000 Scotch pine (*Pinus sylvestris*), 9,000 Austrian pine (*Pinus Austriaca*) and 9,000 native pitch pine (*Pinus rigida*); also about 6,500 plants of Scotch broom (*Genista scoparia*), 700 silver poplars and a considerable quantity of bayberry (*Myrica cerifera*).

A large percentage of the above trees and shrubs are doing well and show a very satisfactory growth, notwithstanding the very unfavorable weather conditions which existed during the season of transplanting, one of the most severe droughts known to this section prevailing during the work of transplanting, — in fact there was no rainfall of sufficient amount to measure during the months of April and May, and but very little in June.

The transplanting of beach grass was commenced about the last of April, but was only continued for a short time, on account of the drought, it being considered better to wait and spend more time and money in fall planting. The grass work was resumed about the middle of September and continued well into the month of

November, about 35 acres in all being planted during the season. All of this work is along the slope of the southern range of sand hills, commencing where we closed up the work of 1897, and extending for a distance of about 2,500 feet in an easterly direction; thus covering with beach grass, from the beginning of the work to the present time, about 125 acres.

We have continued the use of pine seed, as before, among the transplanted grass and along the foot of the slopes; but the unusual drought during the early part of the season prevented the seed germinating as abundantly as in former years, only fair results being obtained.

Our experience the past four years in beach-grass planting has proved to us that the greatest care should be taken in the selection of grass for transplanting; and we have frequently been obliged to go a considerable distance, to secure the best new grass with an abundant root growth. The advantage of fall planting arises from the fact that new grass with good root growth can more readily be obtained in the fall than in the spring.

I am glad to be able to report that, although these lands during the last winter were swept by some of the most violent storms and gales on record, no damage resulted to the completed work, and the slopes which have been covered with beach grass showed that no breaks had occurred and no sand had moved over the entire section thus covered; thus demonstrating, as it seems to me, the wonderful sand-binding qualities of the grass, and that the movements of the great sand dunes which have for years been gradually towards and upon the wooded sections of these lands, and threatening their destruction, can be successfully stopped by its continued use.

I am glad also to be able to report a very favorable condition of the work from its commencement in the spring of 1895, especially along the northern range of sand hills, where the first two years of beach-grass planting was done and the first introduction of young trees and shrubs made, most of these trees and shrubs showing a vigorous and healthy growth, and fully meeting expectations.

But little attention has been given to the cultivation of plants in the nursery during the year. We took therefrom in the spring the young pines and Scotch broom that were used for transplanting, but no work of replanting was done, and it probably will not be necessary in the future to make much use of it for the propagation of young pines; but I think it advisable to make use of it to a certain extent for the starting of the Scotch broom, which must be chiefly introduced by transplanting, as I am still strongly impressed with the value of this shrub in our work.

Nothing has been done during this season towards extending the State road, but some work has been necessary in keeping this and other roads through the Province Lands in good condition, and safe and convenient for public travel.

Respectfully submitted,

JAMES A. SMALL,
Superintendent of the Province Lands.

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